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United States Patent [19]

Johnston et al.

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[45] Date of Patent: Dec. 21, 1999

[54] **FLEXIBLE DASHER BOARD SYSTEM**

[75] Inventors: **Gary A. Johnston**, Waterloo; **Bruce W. Irving**, Brampton, both of Canada

[73] Assignee: **Athletica, Inc.**, Minneapolis, Minn.

[21] Appl. No.: **09/232,893**

[22] Filed: **Jan. 15, 1999**

Related U.S. Application Data

[60] Provisional application No. 60/071,780, Jan. 19, 1998, abandoned.

[51] **Int. Cl.**[6] **A63C 19/00**

[52] **U.S. Cl.** **472/92**; 472/94; 256/24

[58] **Field of Search** 472/92, 94; 256/24, 256/25, 26; 52/204.51, 204.62, 204.66; 62/235

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,727,888	4/1973	Nickolas .
3,844,539	10/1974	Abbott .
3,883,120	5/1975	Tippmann .
4,883,267	11/1989	Burley .
4,905,970	3/1990	Holmsten et al. .
5,706,625	1/1998	Vallance et al. .
5,863,030	1/1999	Kotler et al. 256/24

Primary Examiner—Kien T. Nguyen
Attorney, Agent, or Firm—Greenburg, Traurig

[57] **ABSTRACT**

A flexible dasher board assembly and system that utilizes four different aspects for providing shock absorbing features in order to absorb any of four different types of forces imparted thereon by players. In a first aspect, the entire dasher board assembly is provided with rotational flexibility such that the entire dasher board assembly will pivot about a point substantially near the bottom of the dasher board and close to the ice. In a second aspect, the entire dasher board system is provided with translational flexibility, such that the entire dasher board assembly can be pushed substantially parallel with and away from the ice. In a third aspect, only the shielding panel is provided with rotational flexibility such that the shielding panel (and its support struts in a supported assembly) will pivot about a point within the dasher board. In a fourth aspect, only the shielding panel is provided with translational flexibility such that only the shielding panel (and its support struts) can be pushed substantially parallel with and away from the ice.

13 Claims, 23 Drawing Sheets

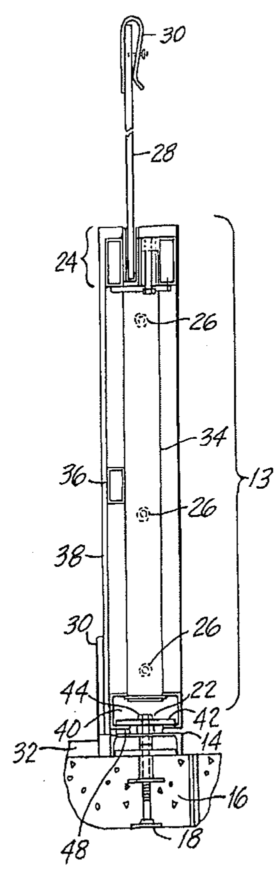


EXHIBIT 1

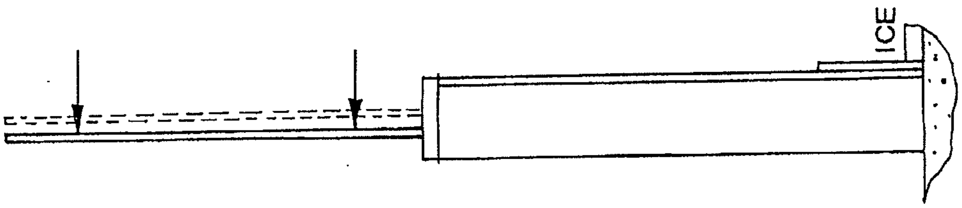


FIG.5

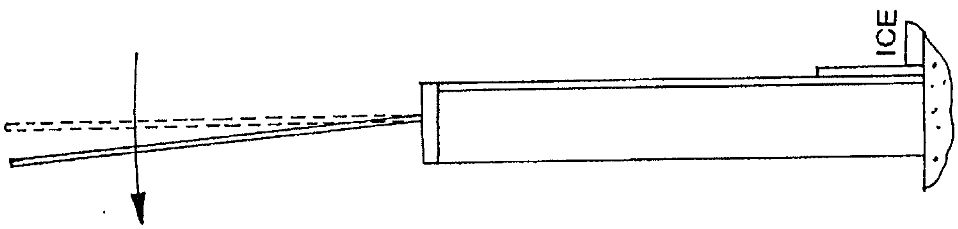


FIG.4

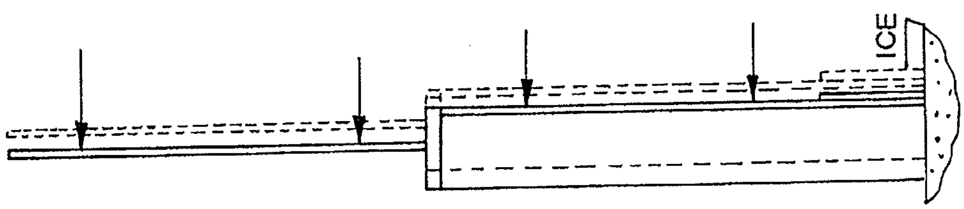


FIG.3

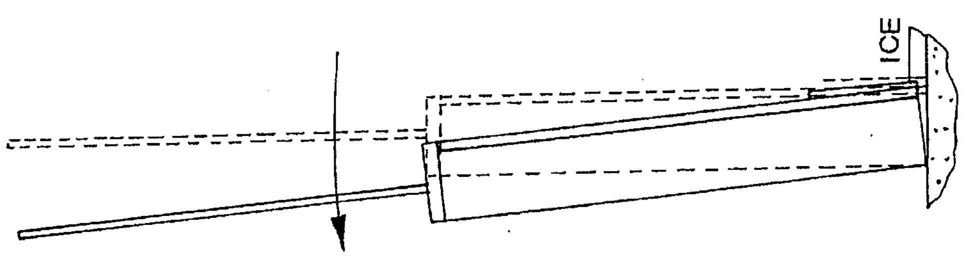


FIG.2

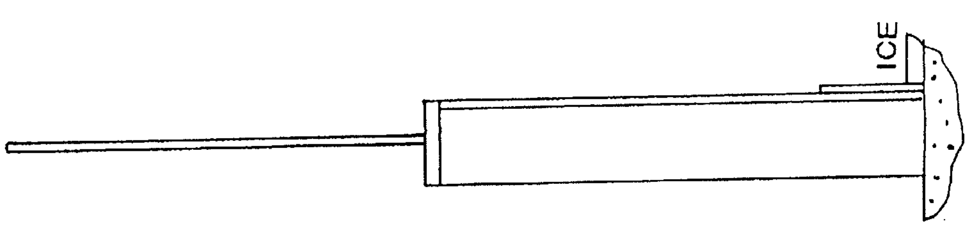
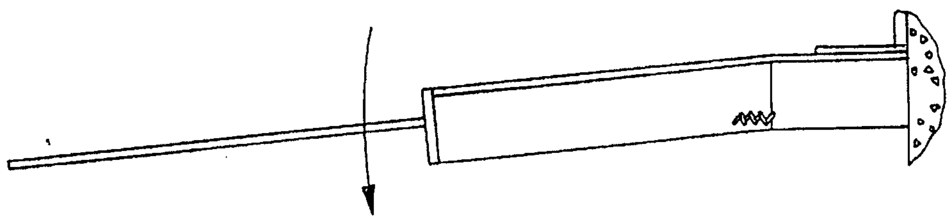


FIG.1



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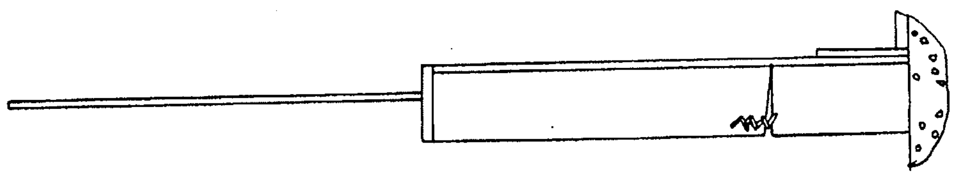

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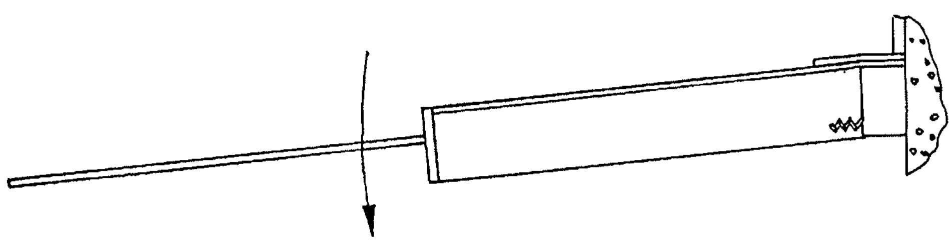

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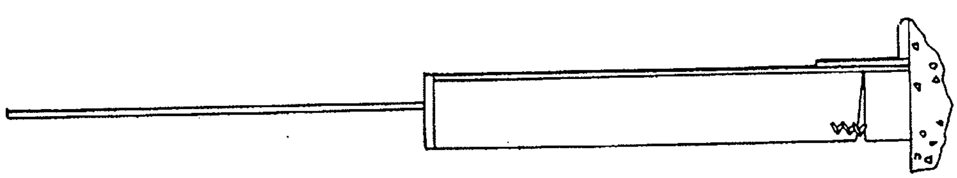


FIG.6

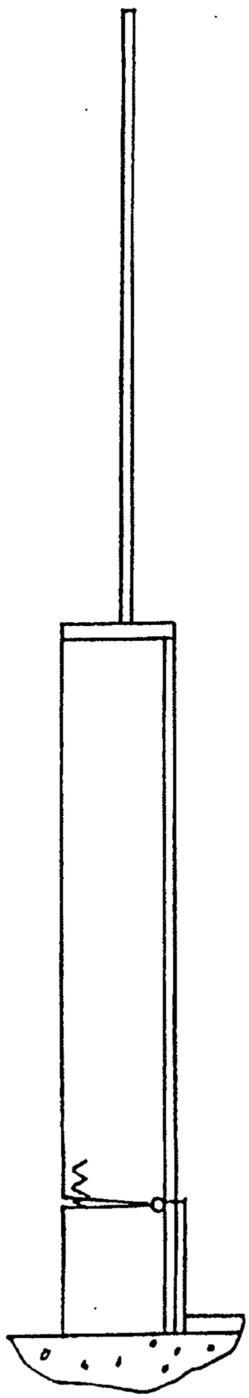


FIG.10

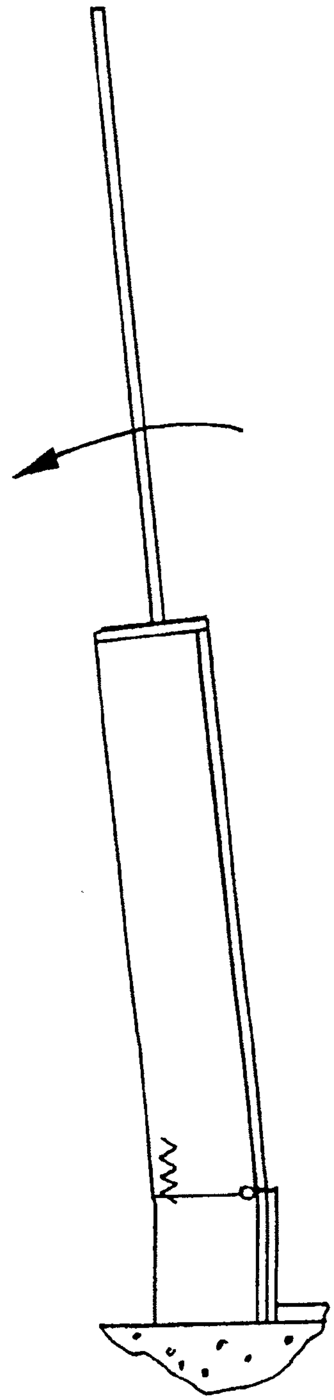
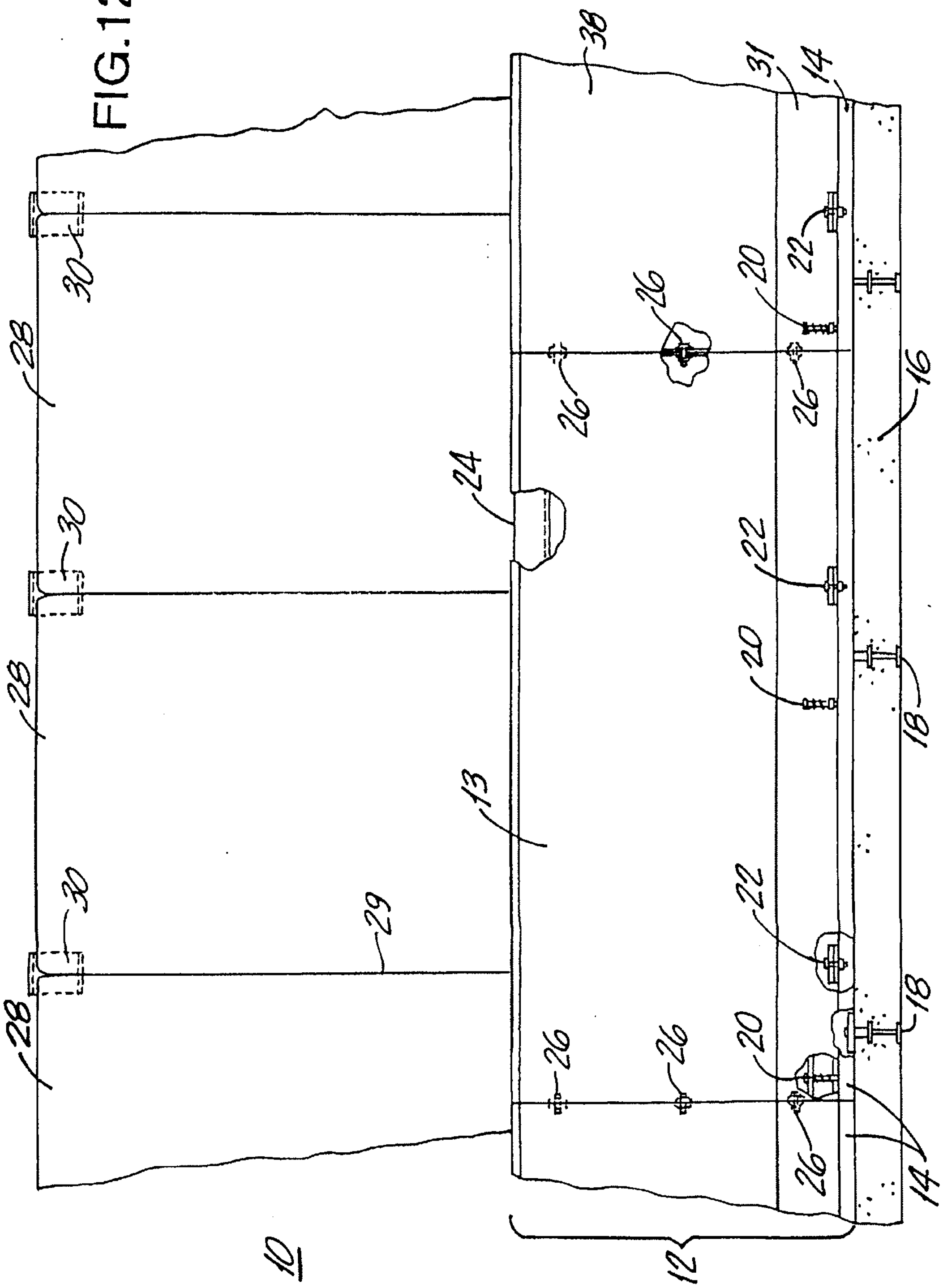


FIG.11

FIG.12



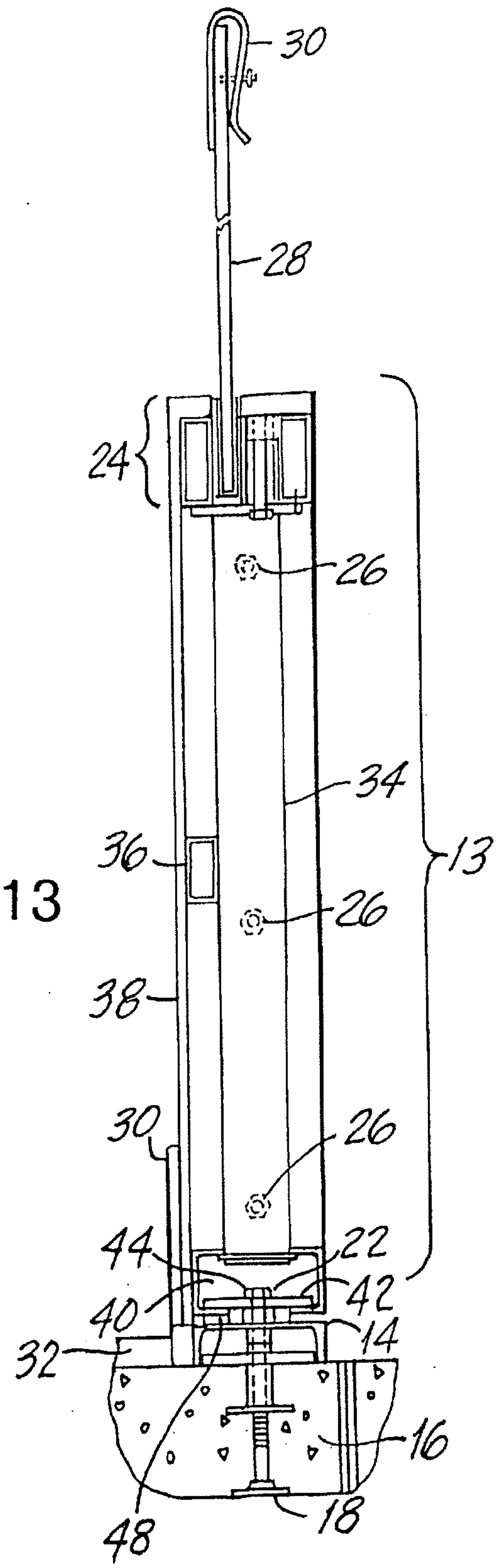


FIG.13

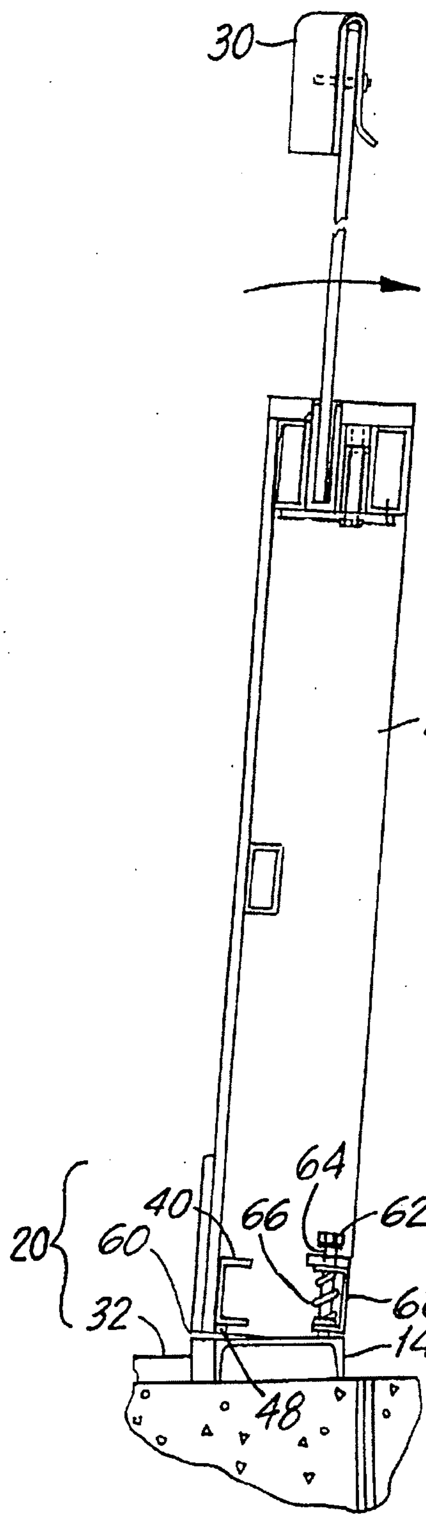


FIG.14A

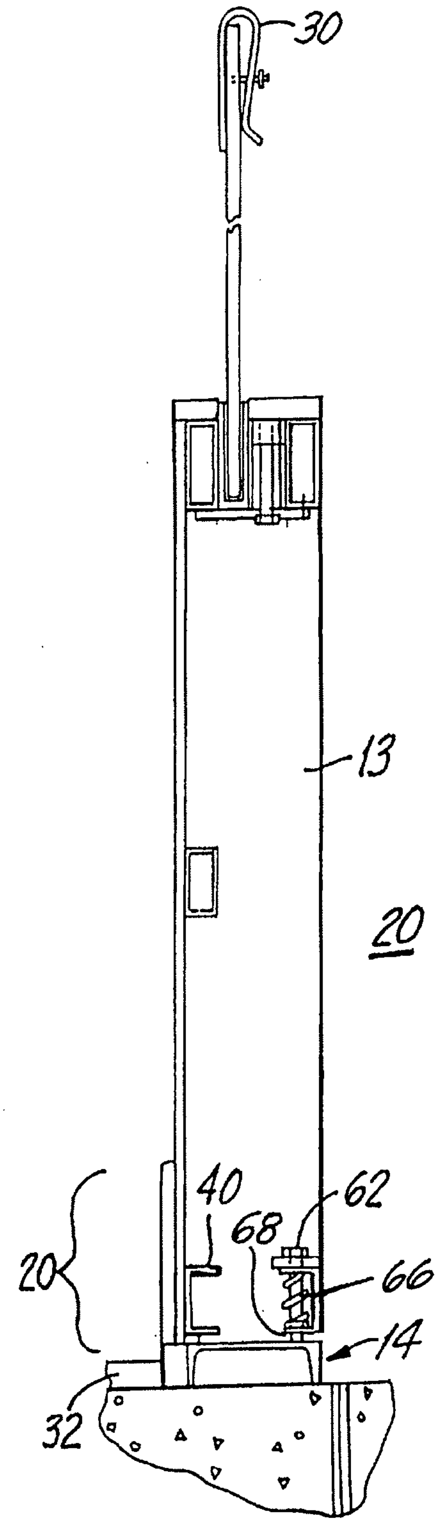


FIG.14B

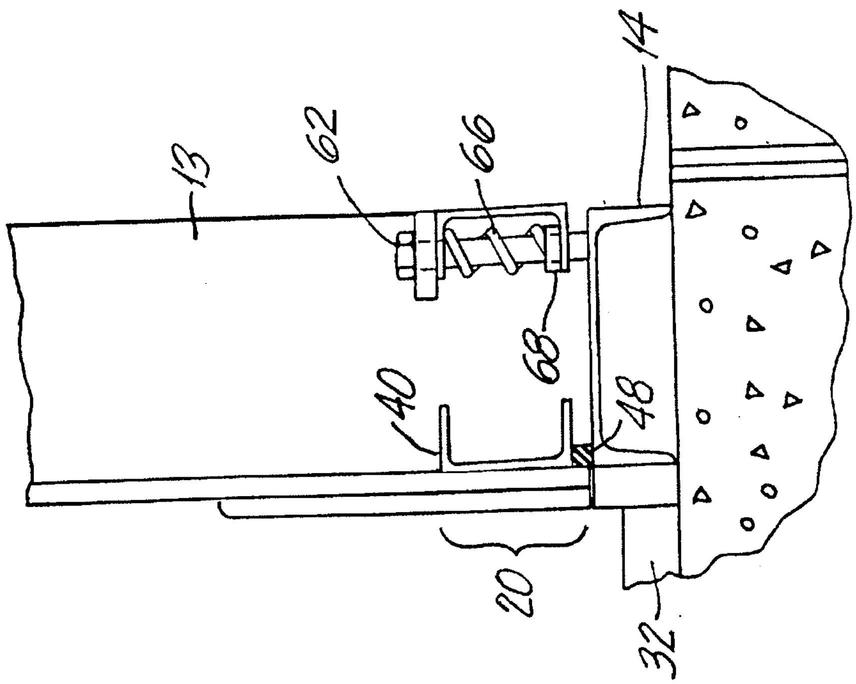


FIG.15B

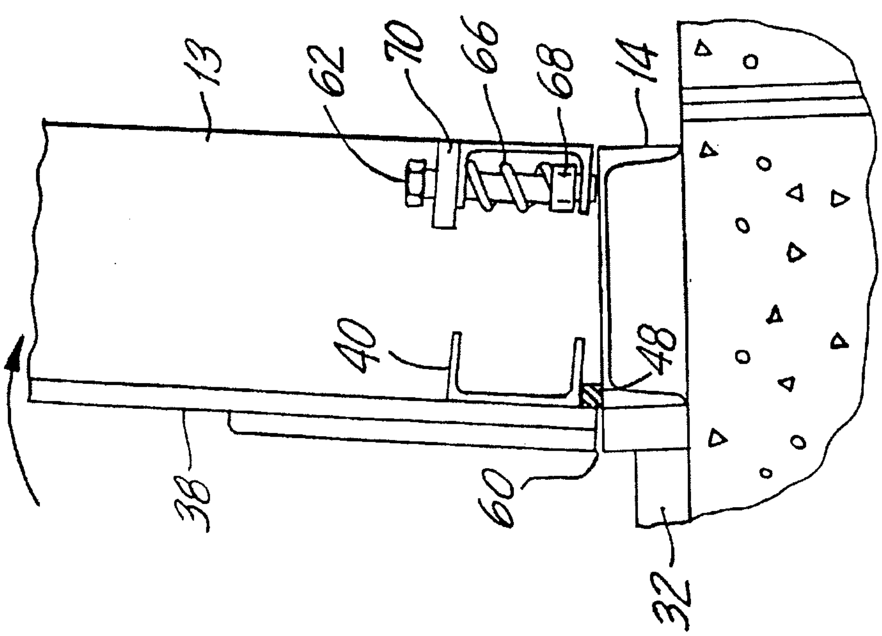


FIG.15A

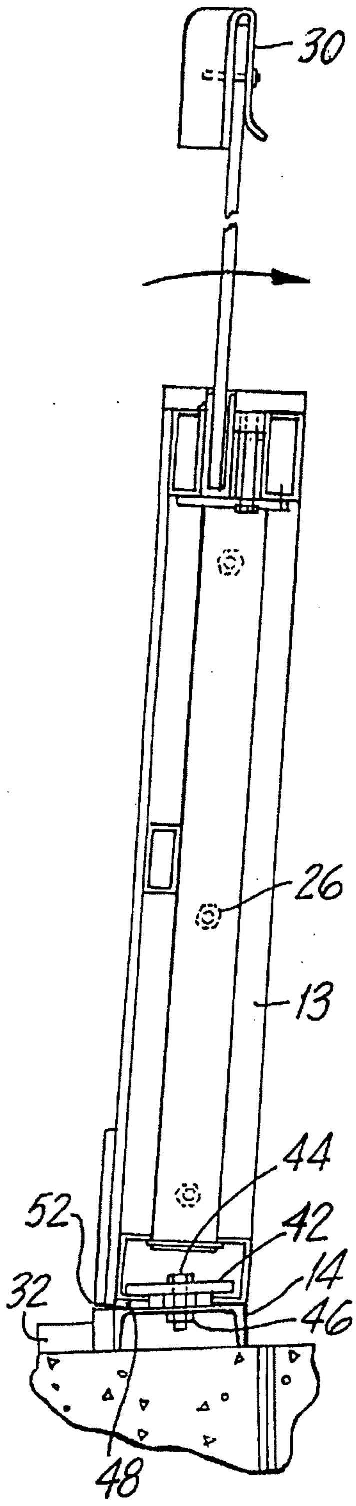


FIG.16A

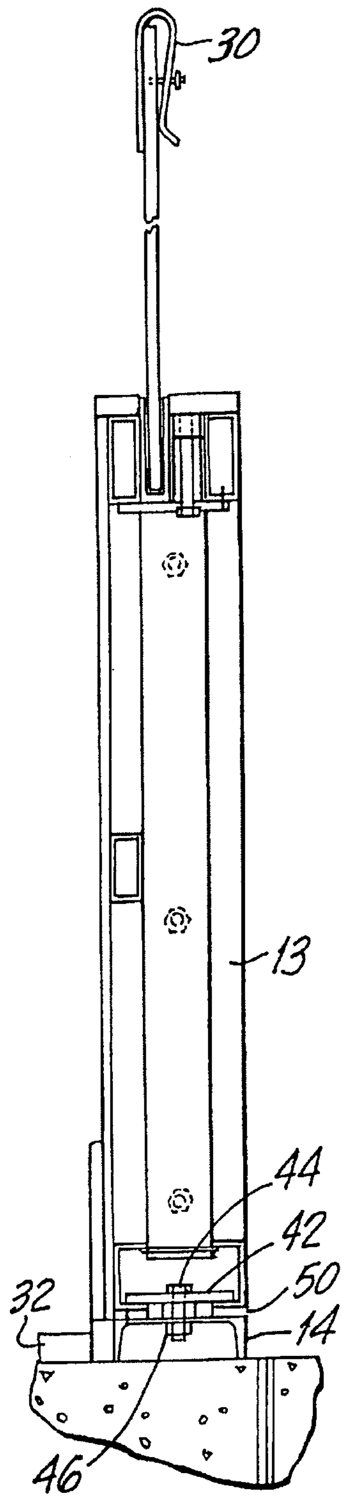


FIG.16B

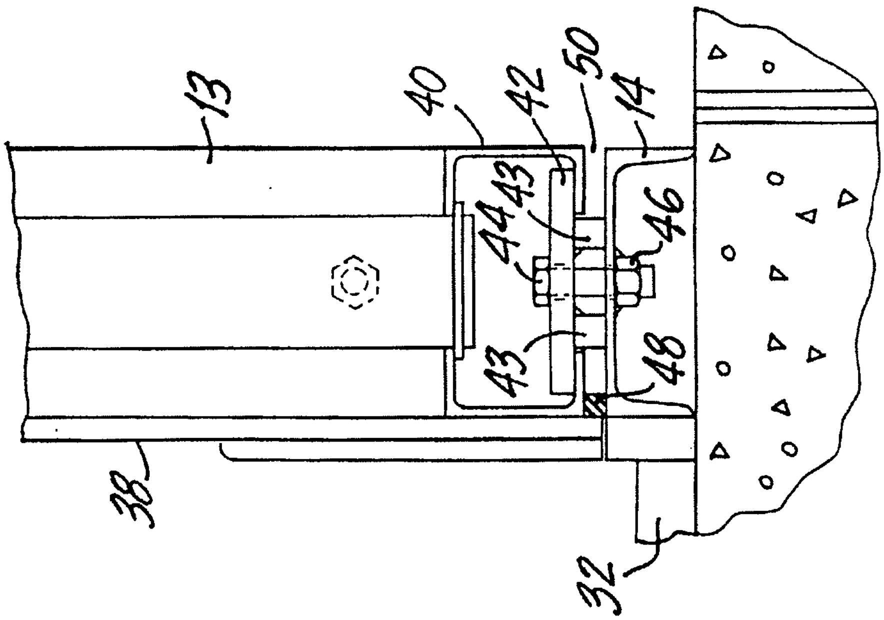


FIG.17B

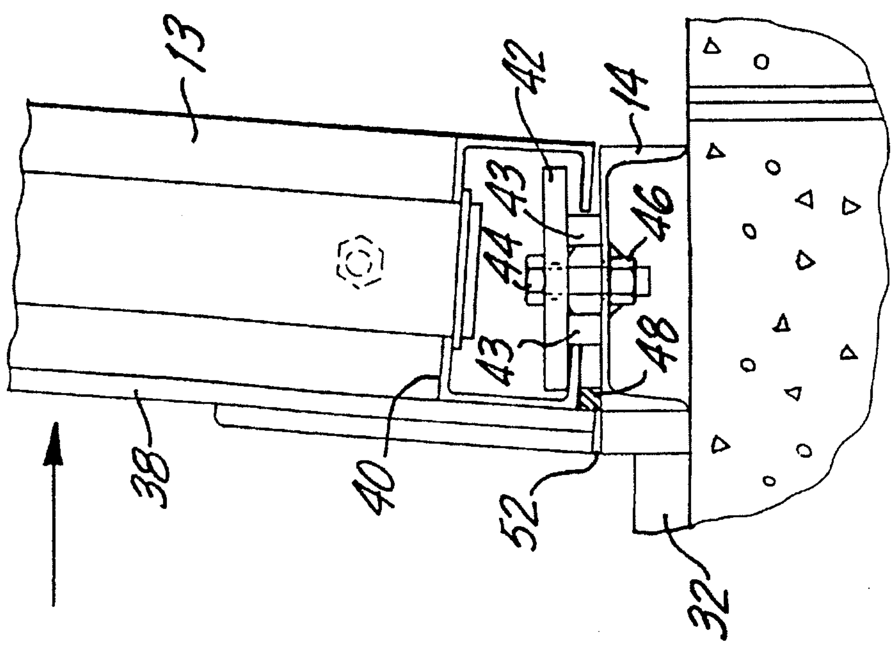
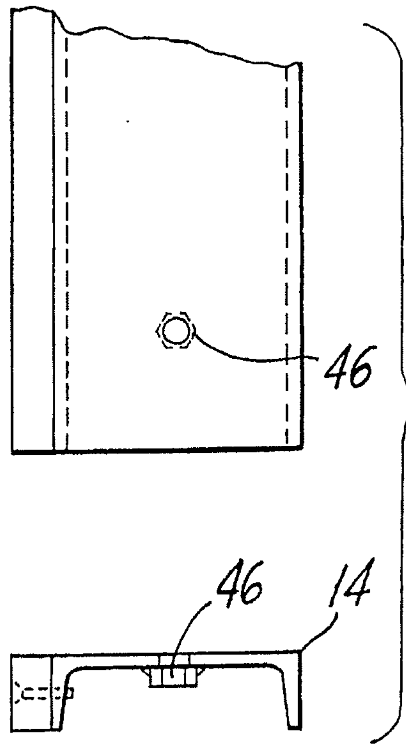


FIG.17A



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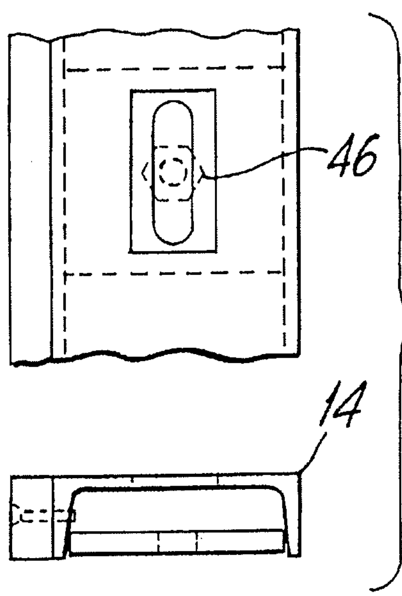

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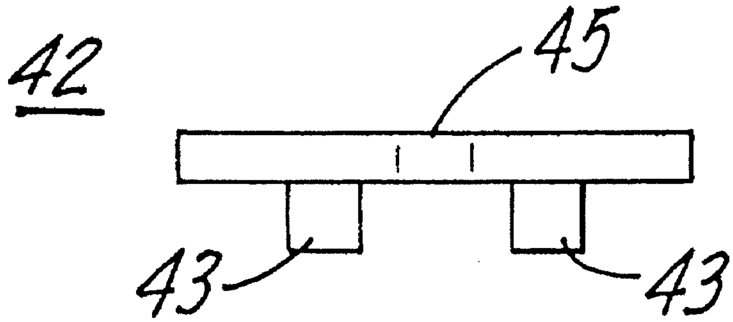


FIG.19A

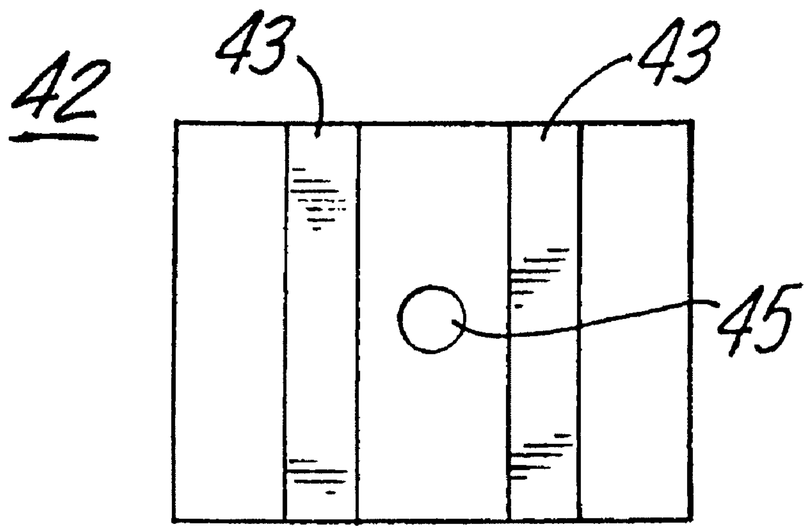


FIG.19B

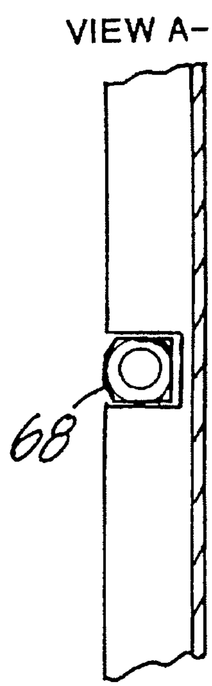
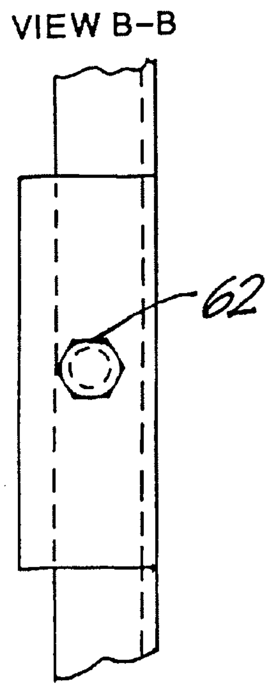


FIG.20A



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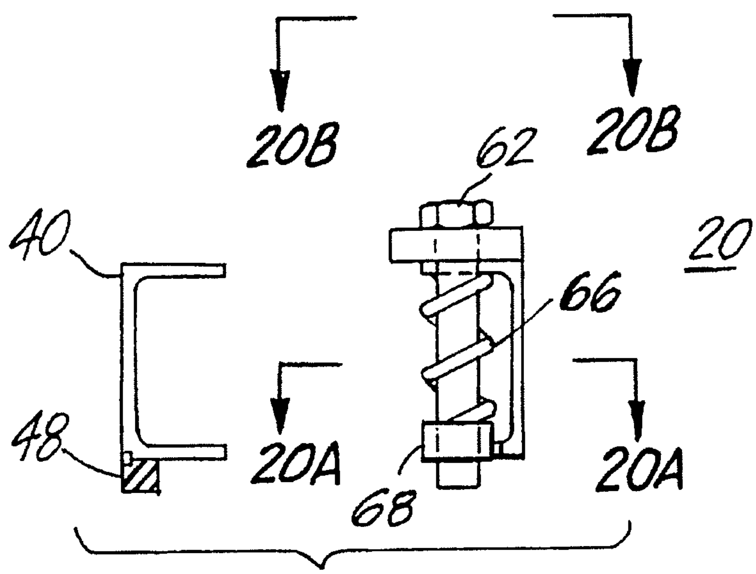


FIG.20

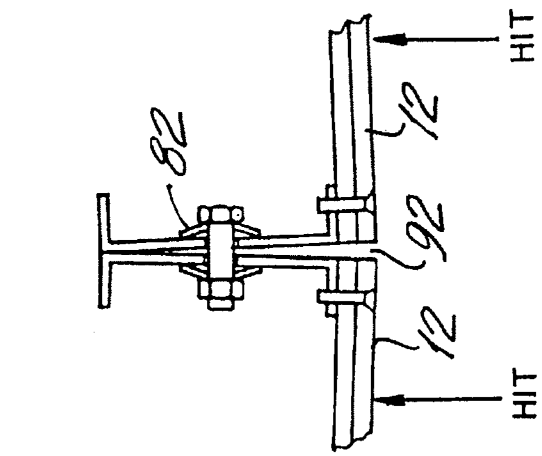


FIG.21C

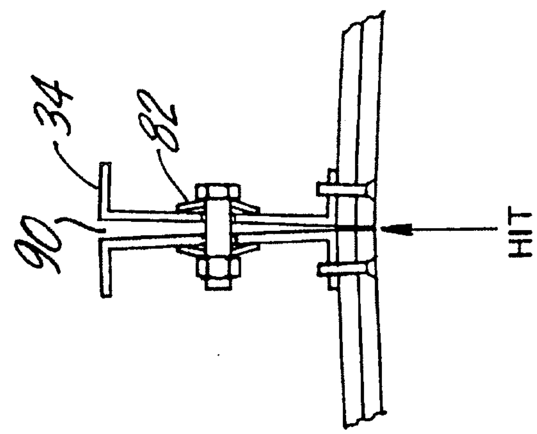


FIG.21B

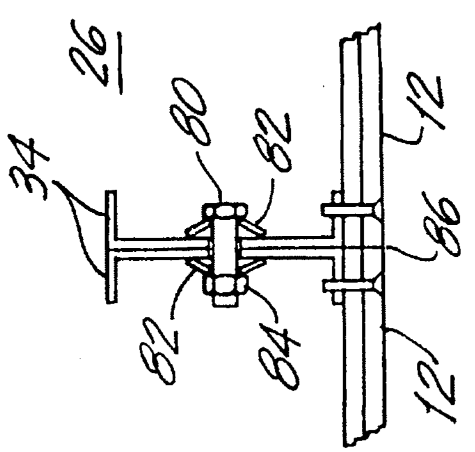
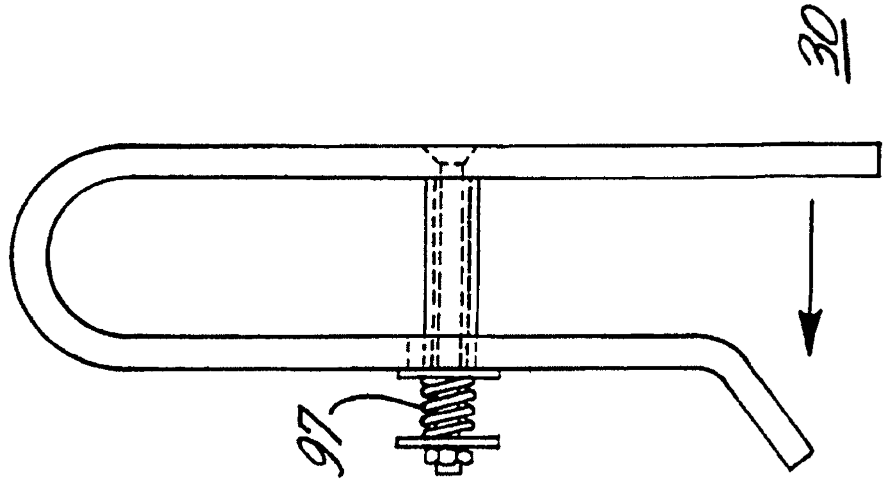


FIG.21A



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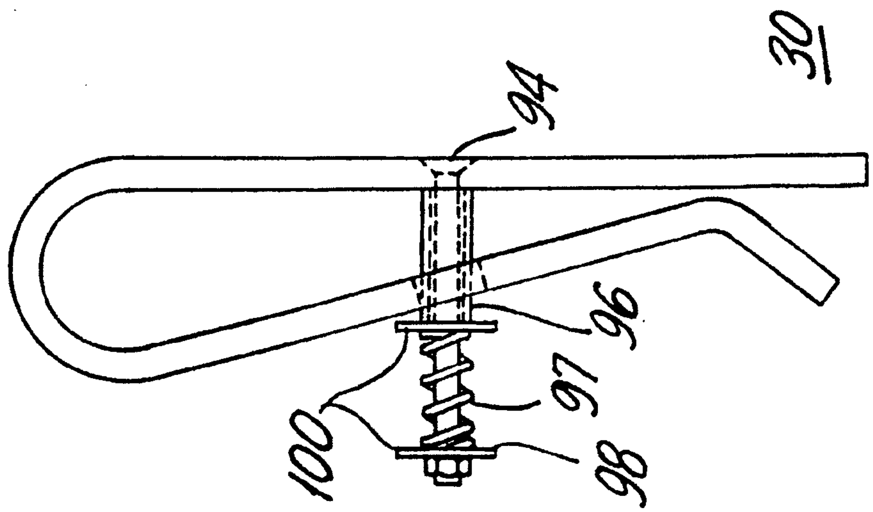
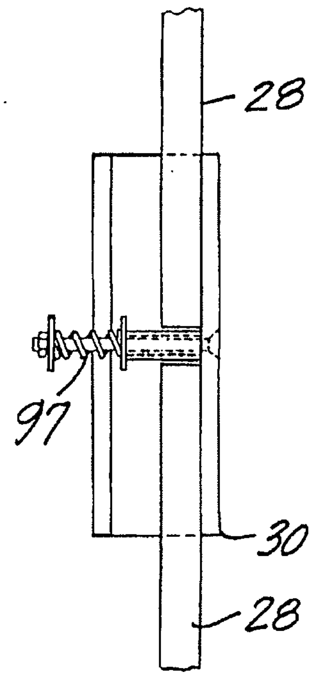


FIG.22A



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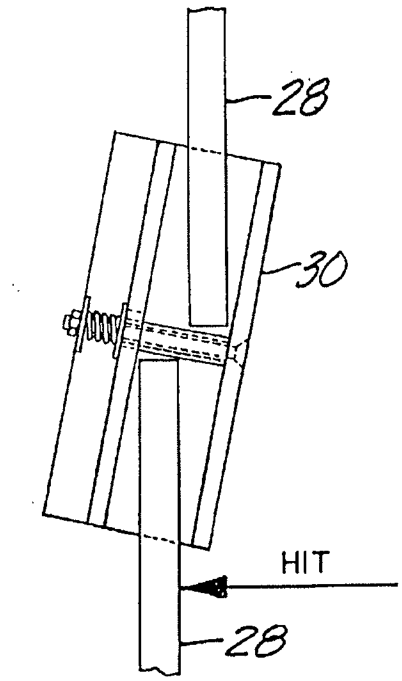


FIG.23B

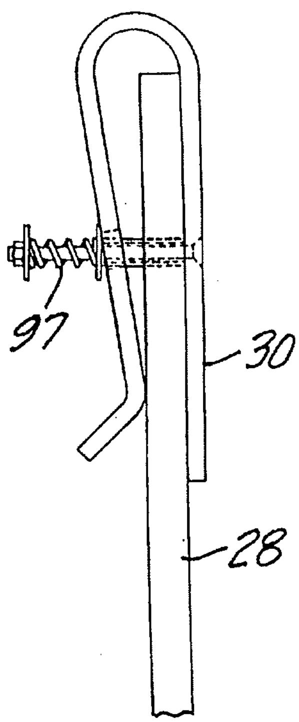


FIG.23C

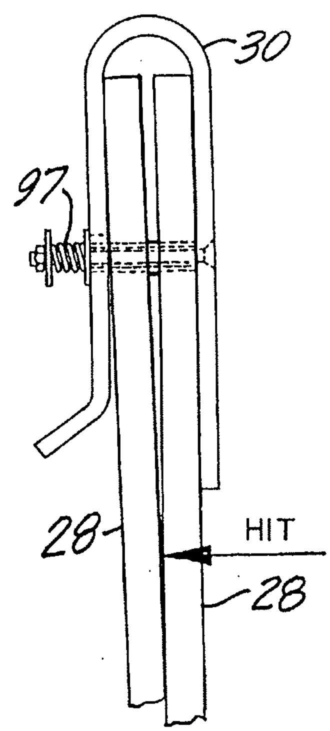
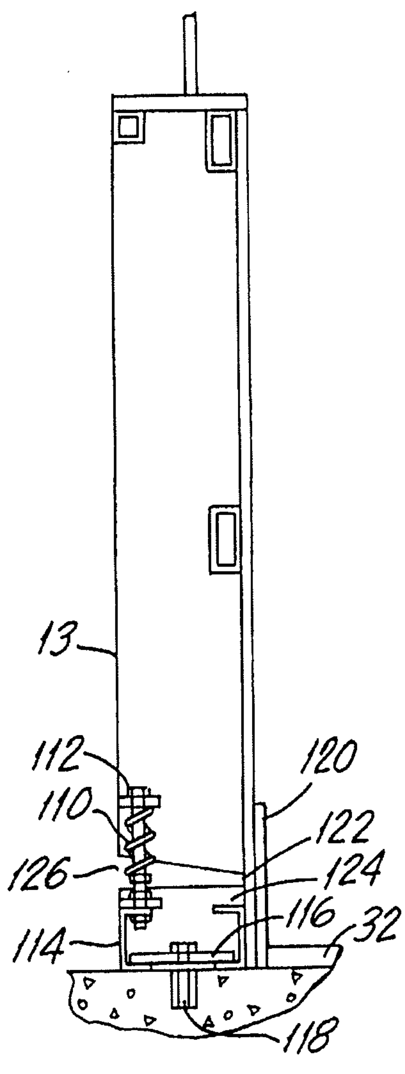


FIG.23D



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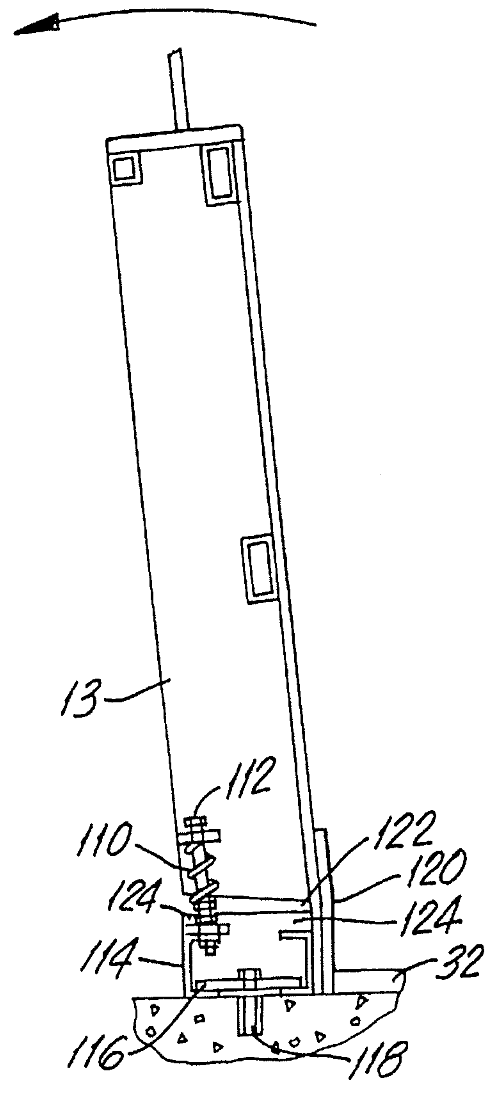


FIG.24B

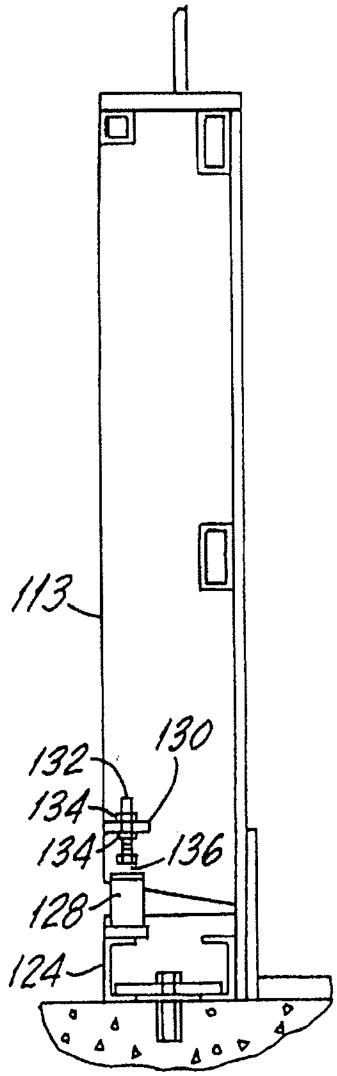


FIG.24C

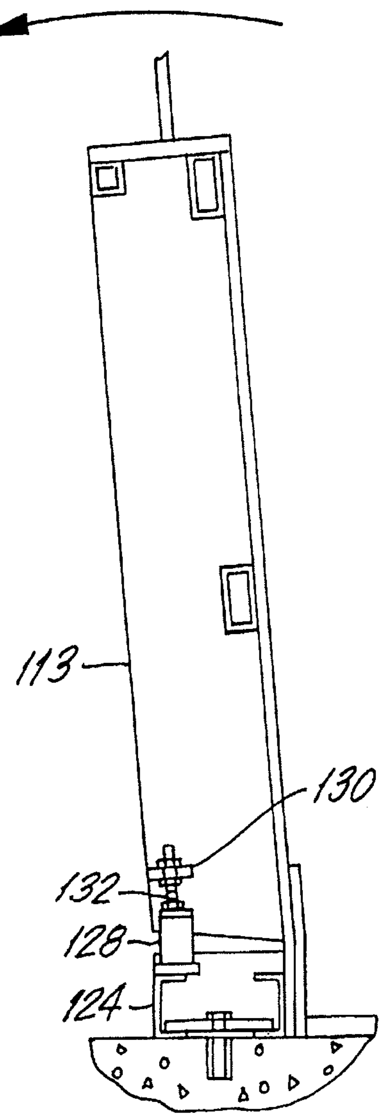


FIG.24D

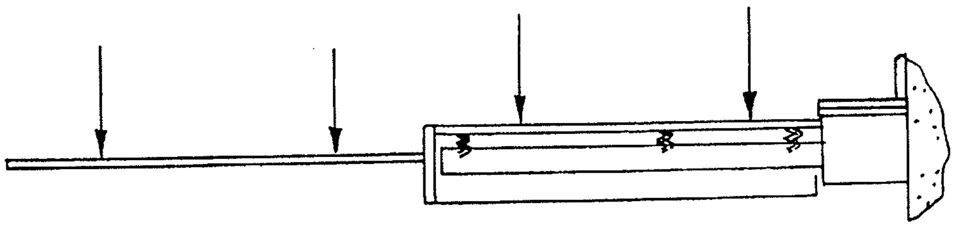


FIG.28

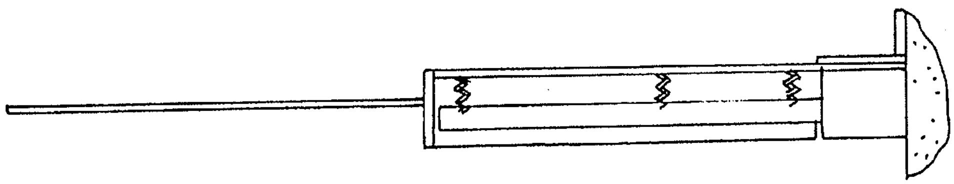


FIG.27

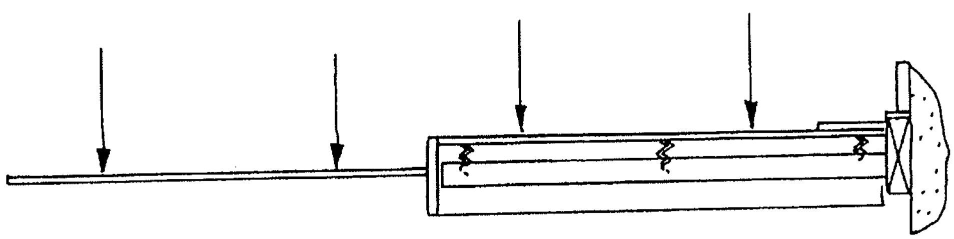


FIG.26

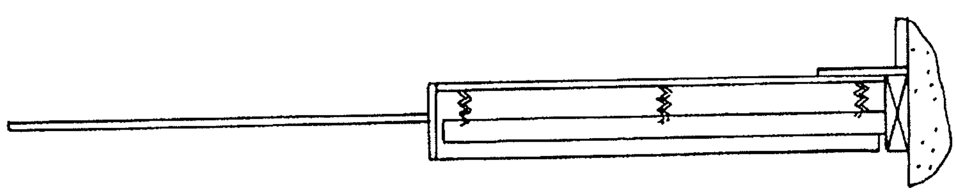


FIG.25

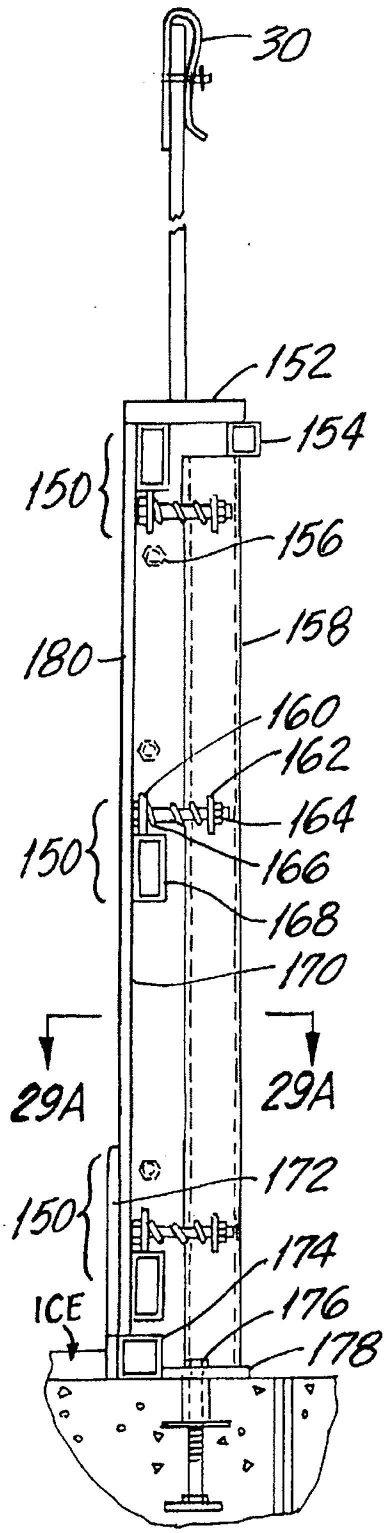
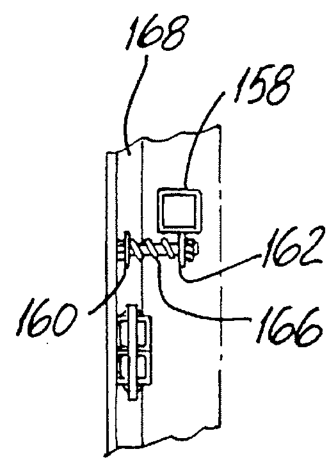


FIG.29



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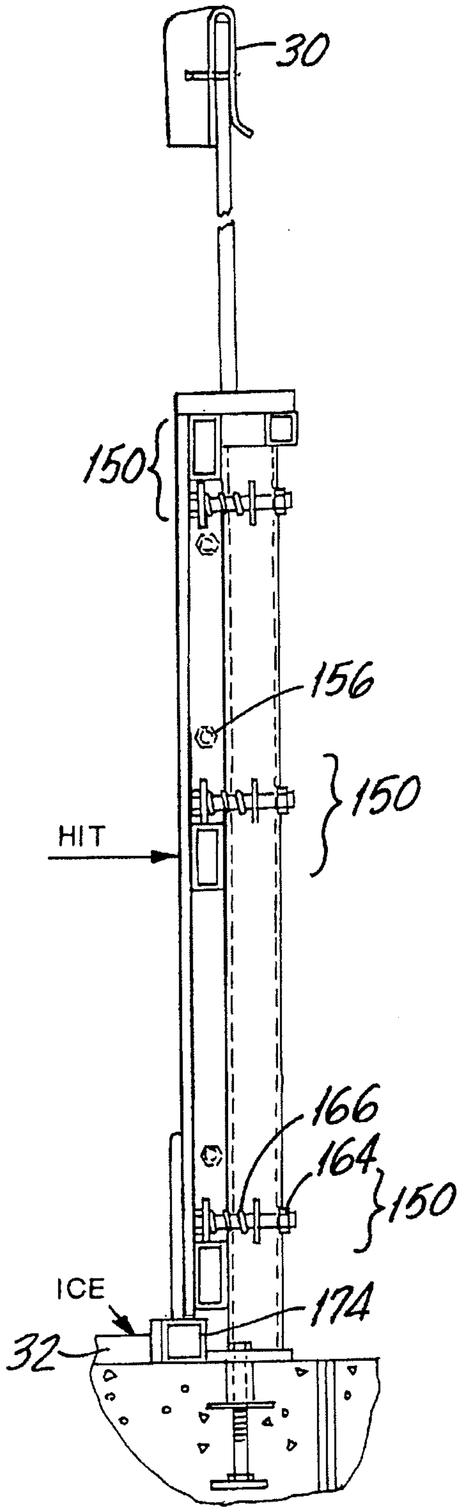


FIG.30A

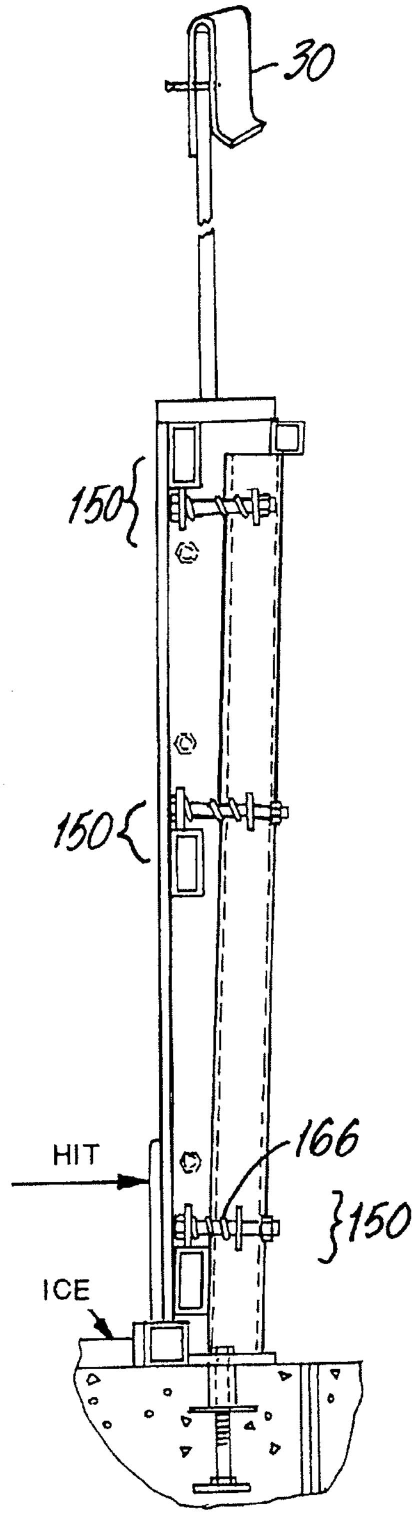


FIG.30B

EXHIBIT 1

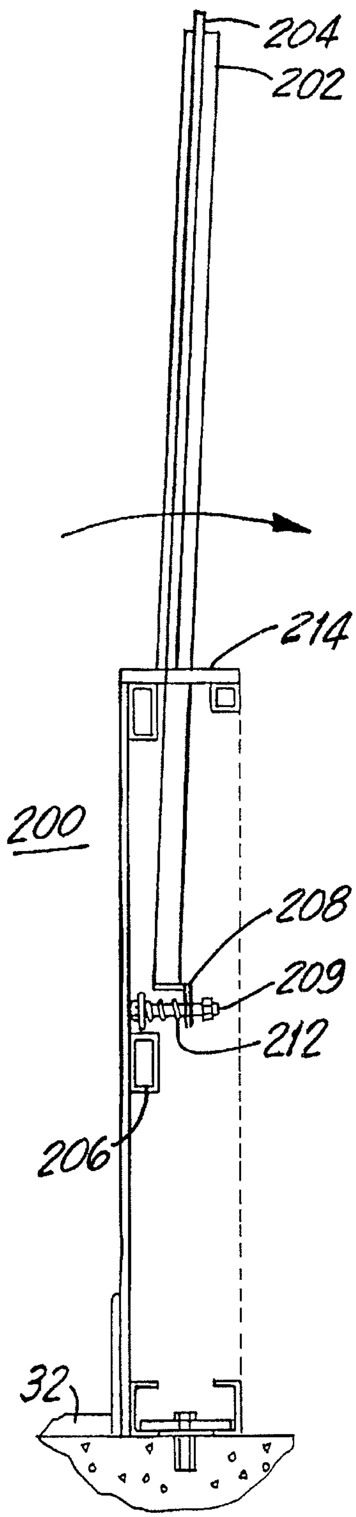
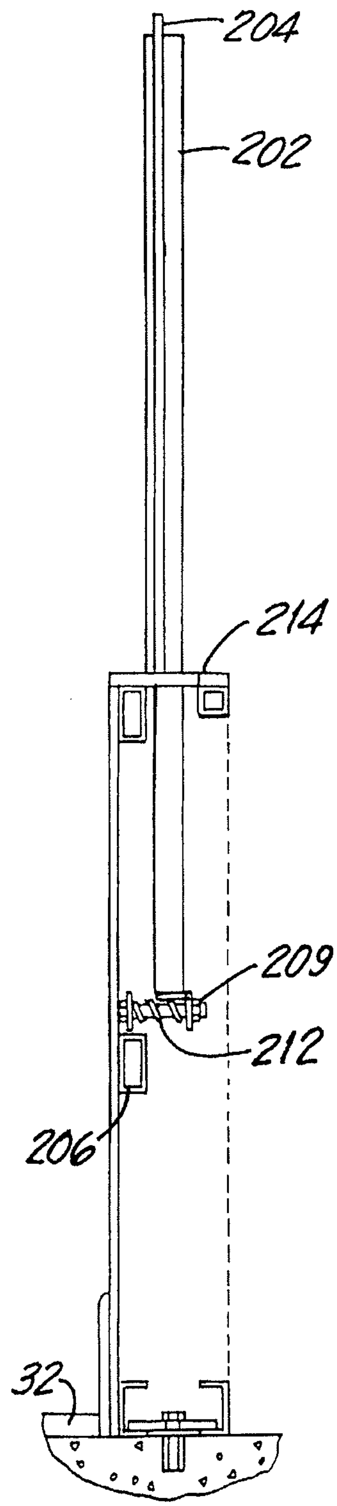


FIG.31A



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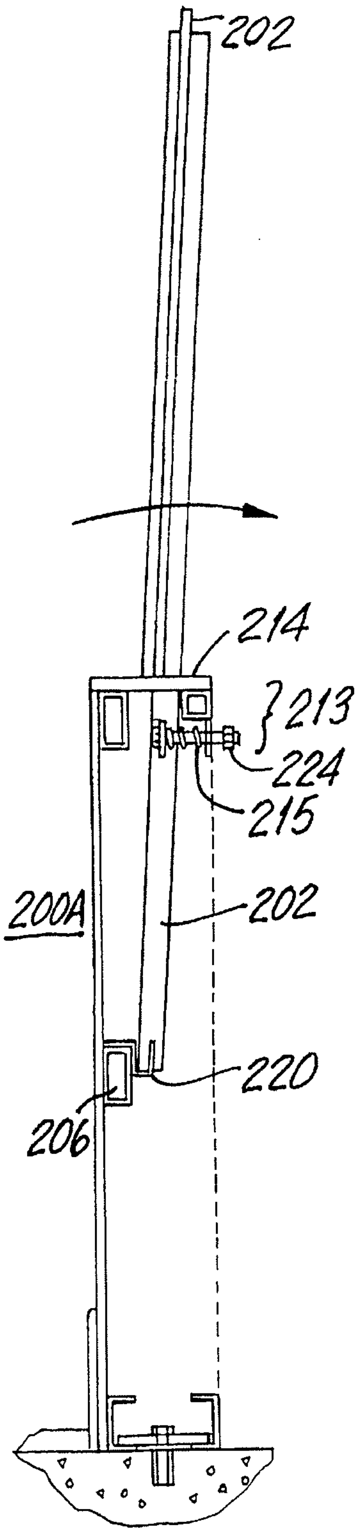
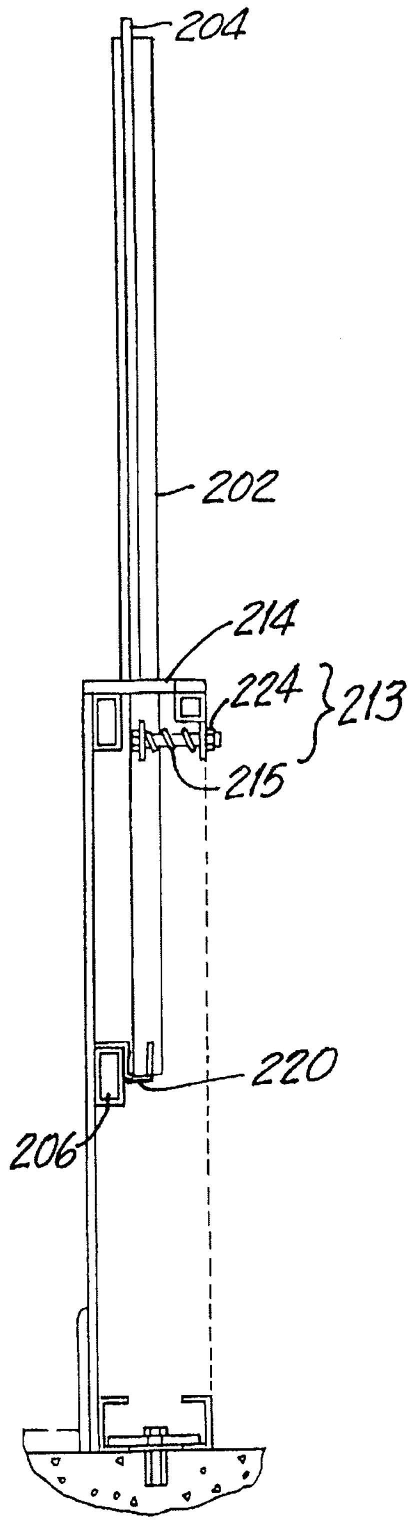


FIG.32A



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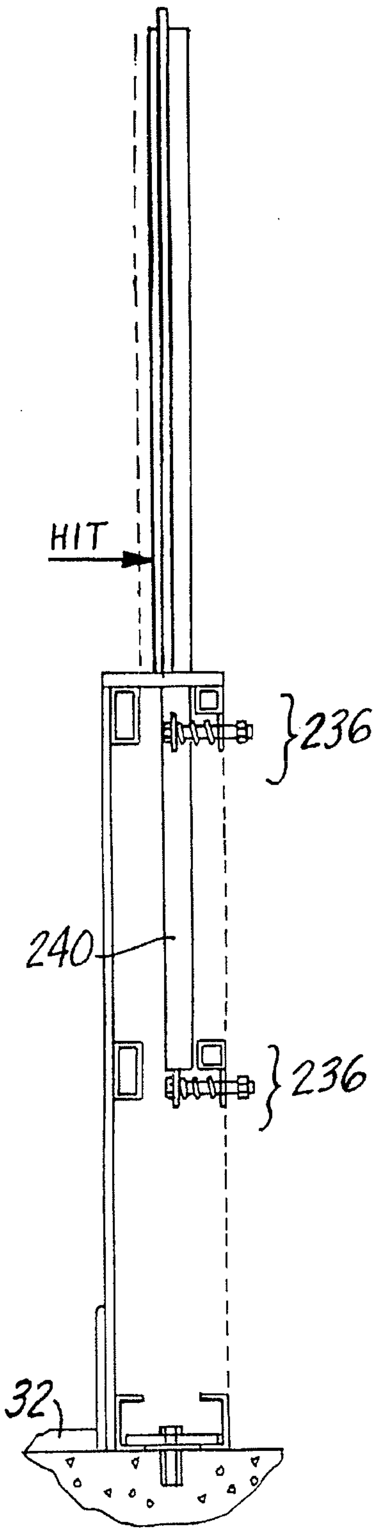

FIG.33A

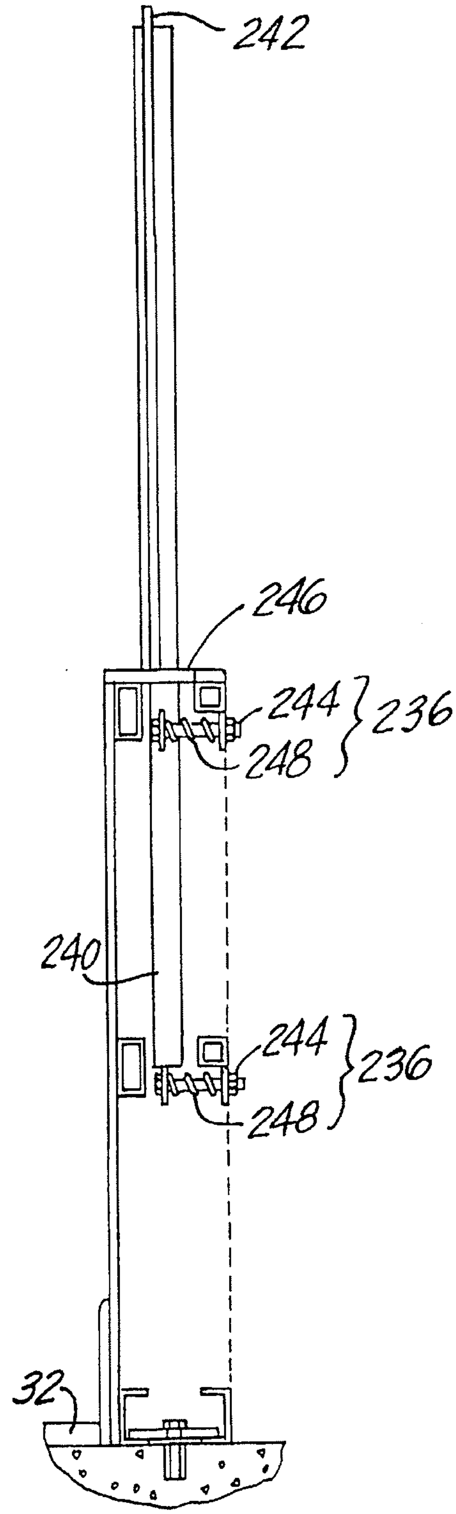

FIG.33B

FLEXIBLE DASHER BOARD SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This application is based on and claims filing priority of U.S. Provisional Application Ser. No. 60/071,780, filed on Jan. 19, 1998, now abandoned, which is incorporated by reference herein.

BACKGROUND OF THE INVENTION

This invention relates to dasher boards such as those used in hockey arenas and the like, and in particular to a dasher board system that is flexible and can absorb shock imparted by collisions with hockey players so as to provide a safer environment for the players.

Dasher boards, which are used to form the boundary around arenas such as hockey rinks, are by necessity designed to be secure and stable in order to withstand great impact by hockey players skating or being pushed into the boards during the course of a game. Concerns have been raised, however, about the potentially harmful effects of the stiffness or lack of flexibility of the boards (the terms "stiff or flexible" as used herein describe how much the boards move when hit by a hockey player). That is, when a player hits the boards, there exists is potential for injury. If the boards are very stiff the risk of injury increases. It is noted that the faster speed and the more aggressive playing style of hockey players are making the stiffness of the boards an important issue due to the potential for injuries.

There exists a wide range in the stiffness of various dasher board systems. In some systems available today, the top of the boards may move only about 1/16" (relatively stiff) or as much as 2" to 3" (relatively flexible) when hit by a player. Some systems utilize boards that are mounted to a concrete block wall, which tend to be stiff. Conversely, a light, demountable, aluminum dasher board frame, with loose anchors and bolts, will resultingly be flexible.

There are six main components to a typical dasher board system, each of which can affect how stiff the boards feel to the players. These components are the dasher board, the ice retainer, the anchoring system, the connecting system, the shielding, and the shield mounting system.

Dasher boards are made in two general methods; a fixed, continuous frame or in demountable sections which are typically eight feet long. Both types typically have vertical posts with horizontal stringers. The frame material is normally wood, fiberglass, steel or aluminum. The frame is covered with polyethylene or a fiberglass sheet. A greater amount of material in the frame typically provides a more rigid and stiffer frame. This also increases the weight, which makes the boards feel harder because the greater mass resists movement. Fiberglass and aluminum are more flexible than steel and may create a more flexible board.

An ice retainer (or ice dam) is sometimes used for demountable boards. If the dasher boards are removed, the ice retainer keeps the ice from creeping away from the playing surface. If there is no ice retainer, the boards are often frozen to the concrete, which will make the boards stiffer. With the ice retainer, the boards are less likely to be frozen down. The addition of the ice retainer can create an extra joint or place for the boards to pivot on, giving it more flexibility. The thickness of the ice retainer may determine how it affects the stiffness of the boards. The ice is normally one to 1½" thick. If the ice retainer is 1" thick, the ice may be in contact with the base of the boards. This may cause the

boards to be frozen to the ice retainer. If the ice retainer is 2" high, the dasher boards will be above the ice and not frozen down.

The anchors that hold the dasher boards to the concrete can affect how stiff the boards are. For the continuous frames, the posts are welded to anchor plates set in the concrete. This style is normally the stiffest. For the demountable style, an anchor bolt holds the frame to the concrete. More anchors, spaced closer together will make the system stiffer. If too few anchors are used, the ice may push the boards out of alignment. If the anchors are loose, too much movement at the base of the boards may break out chunks of ice along of the boards. It is generally accepted that the base of the boards should be held rigid if they are in contact with the ice.

If there is an ice retainer, there can be two sets of anchors. One set holds the ice retainer to the concrete and the other set holds the dasher boards to the ice retainer or to the concrete behind the ice retainer. The set holding the boards could allow movement between the boards and the ice retainer.

Connecting bolts are used to connect the demountable panels together. Normally there are two or three bolts in the vertical end plate that join one panel to the next in a rigid fashion.

Shielding is normally made of tempered glass or acrylic. Tempered glass is ½" thick (6.54 lb/sq.ft.) on the sides of the arena & ⅝" thick (8.17 lb/sq.ft.) on the ends and radius sections. Acrylic is ½" thick (3.1 lb/sq.ft.) in all locations. The acrylic is more flexible than the glass and at half the weight, it moves easier when hit. Again we note that less mass offers less resistance to movement. The disadvantage of acrylic is that it is more easily marked up and therefore becomes harder to see through. It also requires better securing than glass when mounted or it will bend when hit and be pushed out of its supports. Glass, which is thicker, is required at the ends to prevent breakage by the puck. Unfortunately, this thicker (and heavier) glass is located where the players tend to hit the boards the most.

The advantage of acrylic is its lighter weight which makes for easier handling. The standard thickness of ½" is too flexible to be used in the "seamless" or "supportless" systems without some additional support.

In systems with shield supports, the shields are traditionally mounted between vertical supports (on 4' centers). The supports offer some movement to the shielding. The supports themselves are flexible and they move in the mounting hole and the support bracket. Also, the shielding is held in a gasket that offers some movement. The shielding offers some movement relative to the boards. The shield support could be mounted in a flexible bracket that allows the shield support & shielding to move relative to the boards.

In the new "supportless" or "seamless" style dasher boards, the glass shields are held in a slot or U-channel in the top of the boards. The supportless style holds the glass rigid at the top of the boards. At this point the glass and boards move as one.

FIGS. **1–5** illustrate side views of a traditional prior art dasher board and the various forces the boards are subjected to. FIG. **1** illustrates the dasher board at rest, with no external lateral forces present. FIG. **2** illustrates a lateral force that provides a rotational force about an axis near the interface between the dasher board and the floor. If the boards are hit at the top, the frame pivots about the base slightly and the top of the board moves away from the ice. The upper part of the board moves farther than the lower part. Normally the

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base of the boards does not lift off the concrete very much. Some designs in the prior art have added springs behind the boards that allow the boards to lift off the concrete, such as in U.S. Pat. No. 4,883,267. In these designs, the ice can deleteriously creep under the boards and prevent it from returning to its rest position.

FIG. 3 illustrates the translational forces that may be imparted on a dasher board assembly. In the prior art, ice may creep into the area near the bottom of the boards, causing misalignment and other problems.

The shielding may also have rotational and/or translational forces subjected thereupon with respect to the boards as shown in FIGS. 4 and 5. As explained below, an improved shock absorbing characteristic of the shielding relative to the boards can be achieved by mounting the shield supports (in the supported design) or the U-channel (in the supportless design) in a fixture that can move within the boards. This would allow the shielding to move away from the playing surface even if the boards did not move.

SUMMARY OF THE INVENTION

The dasher board system of the present invention utilizes four different aspects for providing advantageous shock absorbing features in order to provide for the different types of forces that may be imparted thereon. In a first aspect of the present invention, the entire dasher board assembly is provided with rotational flexibility such that the entire dasher board assembly will pivot about an axis substantially near the bottom of the dasher board and close to the ice. In a second aspect of the present invention, the entire dasher board system is provided with translational flexibility, such that the entire dasher board assembly can be pushed substantially parallel with and away from the ice. In a third aspect of the present invention, only the shielding panel is provided with rotational flexibility such that the shielding panel (and its support struts in a supported assembly) will pivot about an axis located on top of or within the dasher board. In a fourth aspect of the present invention, only the shielding panel is provided with translational flexibility such that only the shielding panel (and its support struts) can be pushed substantially parallel with and away from the ice.

In particular, the first aspect of the present invention is a flexible dasher board assembly comprising a lower frame adapted to be anchored to the ground, an upper dasher board assembly located over the lower frame assembly comprising means for receiving a shielding panel, pivoting means for pivoting the upper dasher board assembly with respect to the lower frame when the upper dasher board assembly is subjected to a lateral force, and biasing means for biasing the upper dasher board assembly in an upright position when not subjected to a lateral force, the biasing means being compressible by the upper board assembly when subjected to a lateral force in order to allow the upper board assembly to pivot with respect to the lower frame.

The pivoting means comprises an elongated member extending substantially laterally along the upper board assembly whereby a pivoting surface or axis is formed between the elongated member and the lower frame assembly.

The flexible dasher board assembly also comprises means for restraining the upper dasher board assembly from disengaging from the lower frame when the upper dasher board assembly is subjected to a lateral force. The upper dasher board assembly comprises a lower channel extending laterally along its length, the lower channel comprising a slot along its lower surface disposed between a pair of laterally extending flanges. The restraining means comprises a hold down plate assembly, the hold down plate assembly comprising a hold down plate affixed to an upper surface of the lower frame so as to provide a pair of laterally extending gaps therebetween sufficient to captivate the flanges of the lower channel.

The biasing means comprises a spring and a bolt assembly comprising a locknut, the bolt assembly inserted through a retaining portion of the lower channel, the spring being captivated by the locknut and the retaining portion, the bolt assembly adapted such that a lower surface of the bolt is substantially in contact with the lower frame assembly, the spring tending to compress between the locknut and the retaining portion when a lateral force is imparted on the upper dasher board assembly, the spring tending to bias the upper dasher board assembly in an upright position when no lateral force is imparted on the upper dasher board assembly.

A flexible dasher board system is also provided, which includes a plurality of flexible dasher board assemblies interconnected to form an arena for playing a game. Each of the flexible dasher board assemblies is configured as described above. The system also comprises compressible bolt means for flexibly connecting adjacent pairs of flexible dasher board assemblies, each of the compressible bolt means tending to keep adjacent pairs of flexible dasher board assemblies in substantial alignment with each other in the absence of a later force on any of the flexible dasher board assemblies and allowing for movement of the flexible dasher board assemblies with respect to each other when subjected to a lateral force.

The flexible dasher board system also comprises a plurality of shielding panels, each of the shielding panels associated with one flexible dasher board assembly and captivated by the means for receiving a shielding panel, and a plurality of retaining clips, each of the clips configured to receive a top portion of a shielding panel, each of the clips removably attached to tops of adjacent pairs of shielding panels to flexibly align the shielding panels.

In the flexible dasher board system, the upper board assemblies each comprises a pair of vertical posts located at each end thereof, and the compressible bolt means each comprises a bolt and a pair of spring washers, the bolt inserted through the spring washers and a hole in a post of each adjacent upper board assembly and captivated with a nut, whereby the captivated adjacent posts are caused to be in substantial alignment with each other in the absence of a later force on any of the flexible dasher board assemblies and allow for movement of the flexible dasher board assemblies with respect to each other when subjected to a lateral force.

The second aspect of the present invention is a flexible dasher board assembly comprising a rear base portion adapted for mounting to a floor, a front board portion adapted for carrying a shielding panel, and means for slidingly mounting the front board portion with respect to the rear base portion, comprising biasing means for aligning the front board portion with the rear base portion, wherein the biasing means is adapted to allow the front board portion to slide towards the rear base portion when a lateral force is applied against the front board portion.

The front board portion comprises an upper sill extending laterally across the front board portion suitable for receiving a shielding panel, and the means for slidingly mounting the front board portion with respect to the rear base portion comprises a stringer extending laterally across the rear base portion, the upper sill resting on top of the stringer and capable of sliding across the stringer when a lateral force is applied against the front board portion.

The means for slidingly mounting the front board portion with respect to the rear base portion comprises a plurality of translational spring assemblies, each of the translational spring assemblies comprising a bolt/locknut combination connected between a first lug associated with the front board portion and a second lug associated with the rear base portion and captivating therebetween a biasing spring, the biasing springs tending to cause the front board portion to remain in predetermined juxtaposition with the rear base portion in the absence of a lateral force on the front board portion, and allowing the front board portion to slide towards the rear base portion when a lateral force is applied against the front board portion.

BRIEF DESCRIPTION OF THE DRAWING

FIGS. **1–5** illustrate side views of a traditional prior art dasher board and the various forces the boards are typically subjected to; wherein

FIG. **1** illustrates a side view of a dasher board at rest;

FIG. **2** illustrates a side view of the rotational forces on the boards and shielding;

FIG. **3** illustrates a side view of translational forces on the boards and shielding;

FIG. **4** illustrates a side view of the rotational forces on the shielding relative to the boards;

FIG. **5** illustrates a side view of translational forces on the shielding relative to the boards;

FIGS. **6–11** illustrate side views of various aspects of the design concept of a first aspect of the present invention providing rotational flexibility of the dasher board assembly; wherein

FIG. **6** illustrates the dasher board at rest;

FIG. **7** illustrates the rotational movement of the dasher board and shielding;

FIG. **8** illustrates a dasher board similar to FIG. **6**;

FIG. **9** illustrates the rotational movement of the dasher board and shielding of FIG. **8**;

FIG. **10** illustrates a dasher board similar to FIG. **6**;

FIG. **11** illustrates the rotational movement of the dasher board of FIG. **10**;

FIG. **12** illustrates the main components of a preferred embodiment dasher board system in accordance with the first aspect of the present invention that offers rotational flexibility;

FIG. **13** shows a first side cross sectional view of the dasher board assembly of FIG. **12**;

FIGS. **14**A and **14**B show a second cross sectional view of the dasher board assembly of FIG. **12**;

FIGS. **15**A and **15**B are close-up views of FIGS. **14**A and **14**B, respectively;

FIGS. **16**A and **16**B show a third cross sectional view of the dasher board assembly of FIG. **12**;

FIGS. **17**A and **17**B are close-up views of FIGS. **16**A and **16**B, respectively;

FIGS. **18**A and **18**B show views of the ice retainer used in the dasher board assembly of FIG. **12**;

FIGS. **19**A and **19**B show views of the hold down plate used in the dasher board assembly of FIG. **12**;

FIGS. **20**, **20**A, and **20**B show the tension spring and associated components used in the dasher board assembly of FIG. **12**;

FIGS. **21**A, **21**B, and **21**C show the compressible connecting bolt assembly used in the dasher board assembly of FIG. **12**;

FIGS. **22**A and **22**B show the retaining clip used in the dasher board assembly of FIG. **12**;

FIGS. **23**A, **23**B, **23**C, and **23**D show the operation of the clip of FIG. **22**A;

FIGS. **24**A, **24**B, **24**C, and **24**D show an alternative embodiment dasher board system providing rotational movement;

FIGS. **25–28** illustrate side views of various aspects of a design concept of a second aspect of the present invention which provides for translational flexibility, wherein

FIG. **25** illustrates the dasher board at rest;

FIG. **26** illustrates the translational movement of the boards and shielding of FIG. **25**;

FIG. **27** illustrates a dasher board similar to FIG. **25**;

FIG. **28** illustrates the translational movement of the dasher board of FIG. **27**;

FIGS. **29** and **29**A illustrate a cross-section view of a preferred embodiment dasher board assembly of the second aspect of the present invention having translational flexibility;

FIGS. **30**A and **30**B illustrate the operation of the dasher board assembly of FIG. **29**.

FIGS. **31**A and **31**B illustrate a dasher board assembly in accordance with a third aspect of the present invention having rotational flexibility of the shielding panel with respect to the dasher board;

FIGS. **32**A and **32**B illustrate an alternative embodiment to the third aspect of the present invention; and

FIGS. **33**A and **33**B illustrate a dasher board assembly in accordance with a fourth aspect of the present invention having translational flexibility of the shielding panel with respect to the dasher board.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

1. Dasher Board Assembly with Rotational Flexibility

As shown in FIGS. **6–9**, the concept of this first aspect of the present invention is shown, which is a solution to keeping the ice from creeping under the boards while providing rotational flexibility of substantially all of the dasher board. One way is to make the frame in two pieces each with its corresponding facing. The two frames would be connected by a pivot (or hinge as shown in FIGS. **10–11**) and a spring element. The lower part would be rigid and fixed to the concrete. The upper part would be attached above the pivot and allowed to rotate away from the ice when hit as shown in FIG. **7**. There would be a separation of the two pieces, which is hidden behind the kick strip.

A second solution to the prior art problem is to keep the facing in one piece and use it as the pivot. The frame would be made in two pieces with a spring element located near the base. The lower frame would be rigid and fixed to the concrete. The upper frame would be attached above the pivot and allowed to rotate away from the ice when hit. However, there would be no separation at the face of the boards because the facing is all one piece and bends as needed. In each case the spring element is adjustable and a limit (or stop) provided to control the amount of movement.

FIG. **12** illustrates the preferred embodiment flexible dasher board system **10** in accordance with the first aspect of the present invention. The system **10** comprises a series of dasher board assemblies **12** flexibly connected to each other,

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in end-to-end fashion, to form a rink such as a hockey rink. Each of the dasher board assemblies **12** comprises a U-channel assembly **24**, into which an associated shielding panel **28** is removably inserted. This type of system, known generally as a supportless dasher board system, is disclosed in U.S. Pat. No. 5,706,625, which is owned by the assignee of the present invention. As explained in the '625 patent, the shielding panels **28** are inserted into the U-channel assembly **24** of the dasher board assembly **12**, and a cam assembly (not shown) is used to pinch the U-channel assembly around the shielding panel **28** and against a stationary portion of the dasher board assembly **12**, thus pinching the shielding panel **28** into place. This type of assembly does not require the use of support members extending vertically along the edges **29** of the panel **28**, which were formerly used in the prior art to hold the shielding panels in place.

A retaining clip **30** is used to retain adjacent panels **28** in close relation to each other, in particular near the top portions of the panels. Since vertical support members are not used in this embodiment, the use of the clips **30** aid in keeping the adjacent panels **28** aligned with each other. The clips **30** are designed to provide a desired degree of resilience and flexibility, such that the top portions of the panels **28** are able to move in relation to each other in accordance with the present invention. The clips **30** are described in further detail below.

Each dasher board assembly **12** comprises several major components to be described herein, which operate in conjunction with each other to provide the advantageous flexibility of the present invention. Each dasher board assembly comprises an upper board assembly **13** that is located on top of an ice retainer **14**, which is covered by facing **38** and a kick strip **31**. The upper board assembly **13** is flexibly joined to the ice retainer **14** by a series of biasing assemblies **20** and hold down assemblies **22**, which although independent from each other, act in concert to keep the upper board assembly **13** aligned directly over the ice retainer **14** and prevent it from being pushed off the ice retainer **14** when hit by a player, yet provide a desired degree of flexibility or play and return the upper board assembly **13** to its quiescent position over the ice retainer **14** after the player has left contact with the upper board assembly **13** (or panel **28**).

Also aiding in providing the desired flexibility and stability to the system **10** are a series of compressible connecting bolt assemblies **26**, also shown in cutaway of FIG. **12**. These bolt assemblies **26** maintain the ends of the dasher board assemblies **12** in close relation to each other when in a quiescent state, yet allow the dasher board assemblies **12** to move in relation to each other when a force is exerted by a player. The bolt assemblies **26** are also described in detail below.

The entire flexible dasher board system **10** is held in place by a series of anchors **18**, which maintain the ice retainers **14** in secure, fixed position in the concrete floor **16**. The ice retainers **14** thus remain fixed at all times, with the upper board assemblies **13** being allowed to rotate with respect to the ice retainer **14** when a force is exerted by a player at any point along the upper board assembly **13** or panel **28**.

FIG. **13** is a side, cross section illustration of the dasher board system **10** of FIG. **12**, showing in particular the operation of the hold down assembly **22**. The upper board assembly **13** comprises a series of vertical posts **34**, each of which are joined to the top portion of a laterally-running channel **40**. Stringers **36** extend laterally along the posts **34**. The U-channel assembly **24**, described in detail in U.S. Pat. No. 5,706,625, also extends laterally on top of the posts **34** to provide removable support for the panels **28**. The facing **38** is mounted to the front portions of the channel **40**, the stringer **36**, and the U-channel assembly **24**, thus providing the outer surface that is visible to the observer and that is contacted by the player. Also shown in FIG. **13** are the compressible connecting bolt assemblies **26**, which join adjacent dasher board assemblies **12** with each other in flexible fashion.

The hold down assembly **22** is now described in detail, with respect to FIGS. **13**, **16A**, **16B**, **17A** and **17B**. The ice retainer **14** is fixedly joined to the concrete floor **16** by a series of anchors **18**. The hold down plate **42**, which is shown in detail in FIGS. **19A** and **19B**, is a rectangular steel plate with a hole **45** in the center. A pair of steel bars **43** are welded to the steel plate as shown, thus providing the cross section as shown in FIG. **19A**. As shown in close-up in FIGS. **17A** and **17B**, the hold down plate **42** is joined to the top of the ice retainer **14** by a bolt **44** and an associated nut **46** (which may be welded to the bottom of the ice retainer **14** as shown in FIG. **18A**). In particular, the bars **43** make contact with the top of the ice retainer **14** and the bolt **44** is inserted through the hole **45** and a second hole in the ice retainer to be joined with the nut **46**.

Prior to fixing the hold down plate **42** to. the ice retainer **14**, the channel **40** is placed along the top of the ice retainer as shown in FIGS. **17A** and **17B**. The channel **40** is configured so that it can be slid along the length of the ice retainer **14** while the hold down plate **42** is already fixed in place, or the hold down plate **42** may be joined to the ice retainer **14** after the channel **40** is put into place. In either case, the resulting assembly in shown in FIGS. **17A** and **17B**.

A pivot member **48** is joined to the channel **40** as shown in FIGS. **17A** and **17B**. The pivot member **48** extends laterally, substantially along the length of the channel **40**, to provide a support plane on the ice side **32** of the assembly. As shown in FIG. **17B**, a gap **50** exists between the bottom of the channel **40** and the top of the ice retainer **14** on the non-ice side of the assembly. The dasher board assembly is shown in FIG. **17B** in an upright position, which is held there by the biasing assemblies **20** as described in detail below.

Thus, when a force is applied to the facing **38** as shown by the arrow in FIG. **17A**, the upper board assembly **13** will tilt away from the ice **32** by pivoting about the axis defined by the line that adjoins the rear of the pivot member **48** and the top of the ice retainer **14**. This pivoting motion is enabled by the gap **50** on the non-ice side of the assembly. As can be seen, by positioning the pivot line on the ice side of the dasher board assembly, only a minimal gap **52** is created near the ice. This minimal gap **52** is located above the ice line in this aspect of the invention, and is preferably covered by a kick strip **30** (not shown in FIG. **17A**). This is advantageous over the prior art, which provides for a pivot at the non-ice side of the assembly, thus requiring a large gap to open when the boards are contacted by a player, and allowing ice to deleteriously creep into the large gap.

Several hold down assemblies **22** may be strategically located along the length of the dasher board assembly **12**, as shown in FIG. **12**, in order to provide for the upper board assembly **13** to be movably secured to the ice retainer **14**. That is, since the biasing assemblies **20** do not provide any means of securing the upper board assembly **13** to the ice retainer **14**, all means of keeping the upper board assembly **13** from flying off the ice retainer **14** when contacted by a player are provided by the hold down assemblies **22**.

The dasher board assembly is held in an upright position, as shown in FIG. **17B**, by the biasing assemblies **20**, which

are strategically located along the length of the dasher board assembly **12**. Notably, the biasing assemblies **20** and the hold down assemblies **22** are separate assemblies and do not depend on each other to perform their respective functions. Although they are separate assemblies, they operate in concert with each other to provide the required biasing and hold down functions.

FIGS. **14A**, **14B**, **15A**, and **15B** illustrate the biasing assembly **20**, which comprises a spring **66**, a bolt **62**, and a locking nut **68** assembled together around an opening in a retaining portion **70**. As shown in FIGS. **20**, **20A**,and **20B**, the locking nut **68** is held in place, and prevented from turning, by the retaining portion **70**. Thus, when the bolt is rotated, the locking nut is held in place, and the spring **66** will compress or decompress to vary the amount of bias in the assembly **20**.

As shown in FIG. **15B**, the bottom portion of the bolt **62** rests on top of the ice retainer **14** when no force is exerted against the facing **38**. When, however, a force is exerted against the facing by a player, as shown by the arrow in FIG. **15A**, the upper board assembly **13** will be directed away from the ice **32**, pivoting on the pivot member **48**, and the spring **66** will compress between the locking nut **68** and the retaining portion **70**. As such, the spring **66** will tend to bias the assembly back towards its normal, upright state. When the force is removed (the player skates away), then the spring **66** tends to cause the assembly to return to its upright position. The tension exerted by the spring **66** can be adjusted as desired, simply by loosening or tightening the bolt **62** while the locking nut **68** remains in place.

FIGS. **21A**, **21B**, and **21C** illustrate a top cross-section view of the compressible connecting bolt assembly **26** in detail. Each bolt assembly **26** comprises a bolt **80** that is inserted through a spring washer **82**, a hole in the post **34** of a first dasher board assembly **12**, a corresponding hole in the post **34** of an adjoining dasher board assembly, and a second spring washer **82**. A nut **84** is then threaded onto the bolt for captivating this assembly. The amount of resiliency that will be provided by the assembly **26** is determined by the amount of torque imparted on the nut **84** (and of course on the characteristics of the spring washers **82**).

FIG. **21A** illustrates the bolt assembly **26** in its quiescent state, wherein pairs of adjoining dasher board assemblies **12** are aligned with each other as desired. The illustration of FIG. **21A** shows the alignment as substantially linear, which will occur along those portions of the entire rink that are straight. In the corners, however, where curved dasher board assemblies are used, the area around the joint **86** will provide a correspondingly curved surface.

FIG. **21B** illustrates the flexing action of the compressible connecting bolt assembly **26** upon being subjected with a direct hit on the joint **86** by a player. When this type of hit occurs, the joint is caused to move away from the ice, causing the rear portions of the spring washers **82** to expand away from each other, and also causes the front portions of the spring washers **82** to expand away from each other (by a smaller amount). A gap **90** is formed as a result of this action. When the force exerted by the player is removed, the biasing action of the spring washers **82** causes the bolt assembly **26** to return to its quiescent (unbiased) state.

Likewise, FIG. **21B** illustrates the flexing action of the compressible connecting bolt assembly **26** upon being subjected with a hit by a player on the dasher board assembly **12**, on either side (or both sides) of the joint **86**. When this type of hit occurs, the dasher board assembly **12** is caused to move away from the ice, causing the front portions of the spring washers **82** to expand away from each other, and also causes the rear portions of the spring washers **82** to expand away from each other (by a smaller amount). A gap **92** is formed as a result of this action. When the force exerted by the player is removed, the biasing action of the spring washers **82** causes the bolt assembly **26** to return to its quiescent (unbiased) state.

As shown in FIG. **12**, a clip **30** is used to hold in place adjoining pairs of shielding panels **28**. The clip **30** is flexible so as to allow the panels **28** to move in relation to each other when a force is exerted on the boards **12** or panels **28** by a player, yet maintains its original shape so as to aid in returning the panels to their normal aligned state after the force is removed.

FIGS. **22A** and **22B** illustrate a side view of the clip **30**. The clip **30** is fabricated from a piece of plastic such as LEXAN that is about 5½" wide by 13½" long, and is shaped by conventional means to form the clip **30** as shown in a hairpin-like cross-section. After shaping, the length of the clip **30** is about 6¼". The clip **30** is assembled onto an adjacent pair of panels by using the bolt **94**, the sleeve **96**, the compression spring **97**, the washer **98**, and the nut **100** as shown. FIG. **22B** illustrates the resiliency of the clip **30**, which can open as shown when a force is exerted as indicated by the arrow. The compression spring **97** aids in biasing the clip back to its quiescent state of FIG. **22A** after the force is removed. The sleeve or tube **96** keeps the glass panels from touching the steel bolt so that chipping of the glass is avoided.

The clip will thus expand when a force is imparted on a shielding panel **28** as shown in FIG. **23A**, **23B**, **23C**, and **23D**. FIGS. **23A** and **23B** show a top view of a pair of panels **28** being spread apart from each other due to a force as indicated by the arrow. The clip will expand accordingly to allow the panels **28** to temporarily shift, thus providing a shock-absorbing effect. FIGS. **23C** and **23D** illustrate this same principle from a side view.

In addition, the steel bolt and clear flexible sleeve **96** may be replaced by a nylon bolt, which will help prevent damage to the glass.

Thus, by providing the dasher board system as described above, the biasing assemblies **20**, the hold down assemblies **22**, the compressible connecting bolt assemblies **26**, and the clips **30** all act independently, yet in concert, to provide the desired flexibility and shock absorbing characteristics.

FIGS. **24A**, **24B**, **24C**, and **24D** illustrate an alternative embodiment of the first aspect of the present invention. This embodiment operates on the same principle as the preferred embodiment discussed above; which is the use of a pivot axis located near the front (ice side) of the dasher board assembly so that little or no gap is created at the front when the dasher board assembly is struck by a player and caused to flex as shown by the arrow in FIG. **24B**. Thus, this embodiment utilizes a pivot or hinged axis **122**, that is covered by a kick strip or facing **120**, to provide the rotational flexibility. The cross-sectional profile of the upper board assembly **13** is such that an angular gap **126** is formed between it and the ice retainer **124**, which is fixed to the concrete surface by anchors **118**. In particular, the anchor **118** is inserted through a plate **116**, which is urged against the bottom of channel **114** to cause the ice retainer **124** to be fixed with respect to the concrete floor. A bolt **112** is inserted through a portion of the upper board assembly **13**, a spring **110**, and a portion of the ice retainer **124**, as shown in the Figures. In addition, tensioning nuts are provided so the amount of bias can be adjusted as desired. As a result of this

configuration, the upper board assembly is supported over the ice retainer, and the spring **110** provides adequate bias so as to keep the assembly aligned as desired.

When a player contacts the upper board assembly **13** so as to cause a force in the direction of the arrow in FIG. **24**B, the spring is compressed and the upper board assembly **13** is caused to rotate around the pivot axis **122** away from the ice. Once the force is removed, the biasing action of the spring **110** returns the upper board assembly **13** to its normal position as in FIG. **24**A.

In order to control the flexing action of the upper board assembly **13**, an adjustable stop mechanism is provided as shown in FIGS. **24**C and **24**D, which is a cross section taken at a different lateral location of the board assembly. The upper board assembly **13** comprises a lug **130** affixed as shown in the Figures, into which a bolt **132** is captivated by a pair of nuts **134**. The position of the head of the bolt **132** can be adjusted with the nuts **134**, so that a gap **136** is created as desired. A stop block **128** is affixed to the ice retainer **124** as shown. When the upper board assembly **13** is caused to rotate with respect to the ice retainer **124**, the head of the bolt **132** will strike the top surface of the stop block **128** and be prohibited from moving further, as shown in FIG. **24**D. When the force applied on the boards is removed, the spring **110** will cause the assembly to return to its normal upright position.

2. Dasher Board Assembly with Translational Flexibility

FIGS. **25**–**28** illustrate side views of various aspects of the design concept of the second aspect of the present invention which provides for translational flexibility. FIG. **25** illustrates a dasher board provided with biasing springs that would compress to allow translational movement of the entire board assembly when subjected with a lateral force. FIG. **26** illustrates the translational movement of the boards and shielding of FIG. **25** when subjected with a force as shown by the arrows. The springs compress, and allow the board assembly to move away from the ice, thus absorbing the shock. FIG. **27** illustrates a dasher board similar to FIG. **25**; FIG. **28** illustrates the translational movement of the dasher board of FIG. **27**.

FIGS. **29** and **29**A illustrate a preferred embodiment of this second aspect of the present invention, wherein the entire dasher board system is provided with translational flexibility, such that the entire dasher board assembly can be pushed substantially parallel with and away from the ice. In particular, FIG. **29** illustrates a cross section view of a dasher board assembly **12**A, which comprises a series of vertically extending posts **158** that are each welded to a steel base plate **178**. The base plate is secured to the concrete floor by an anchor **176**. A fixed stringer **154** is disposed horizontally, and is welded to each of the vertical posts **158**.

A panel assembly **180** comprises a planar facing section **170**, which is adjoined to a horizontally extending sill **152**, into which the shielding panel is inserted. Three stringers **168** extend horizontally across the panel assembly **180**. Each stringer **168** comprises a lug **160** welded thereto as shown in FIG. **29**.

The panel assembly **180** is movably joined to the posts **158** by a series of translational spring assemblies **150**, whereby a bolt/locknut combination **164** that is used to connect lug **160** with an associated lug **162**, and a spring **166** is inserted on the bolt **164** to provide the desired biasing. By providing three such translational spring assemblies **150** on each post **158**, biasing is provided at the top, middle, and

bottom portions of the dasher board assembly. The drawing in FIG. **29** illustrates a cross section showing one such post **158**; in actuality the dasher board assembly will utilize two or three posts in this fashion.

Notably, the underside of the sill **152** is free to slide across the top of the stringer **154** when the dasher board assembly is subjected to a force. In addition, a tubular ice retainer **174** is fixed with respect to the floor, and provides the required stability for the ice such that ice will not creep into the dasher board assembly.

FIGS. **30**A and **30**B illustrate the operation of this embodiment when the dasher board assembly is subject to various forces by contact from a player. In FIG. **30**A, a player strikes the approximate center of the panel assembly **180**, and all three translational spring assemblies (upper, middle and lower) are compressed, and the entire panel assembly **180** moves toward the fixed posts **158**, thus absorbing the shock imparted thereon by the player. When the force is removed, the bias action of the springs **166** causes the panel assembly **180** to return to its quiescent state.

In FIG. **30**A, a player strikes the lower portion of the panel assembly **180**, and the lower translational spring assembly is compressed, and the lower portion of the panel assembly **180** moves toward the fixed posts **158**, thus absorbing the shock imparted thereon by the player. The middle translational spring assembly **150** may also be caused to move, but in a much lesser amount than the lower one. In addition, the upper translational spring assembly **150** may move, but again in a much lesser amount. When the force is removed, the bias action of the springs **166** causes the panel assembly **180** to return to its quiescent state.

3. Shielding Panel with Rotational Flexibility

In a third aspect of the present invention, the shielding panel is provided with rotational flexibility with respect to the dasher board assembly such that the shielding panel and its support struts will rotate about an axis where the panel is inserted into the dasher board (i.e. at the sill **214**). This is shown in FIGS. **31**A and **31**B.

This embodiment differs from the previously described embodiments in one major respect since it utilizes a supportbased dasher board assembly, rather than the supportless design described above. Thus, a dasher board assembly **200**, shown in cross section view, comprises a pair of support struts **202**, into which a shielding panel **204** is inserted. The struts **202** extend through an opening in the sill **214**; each has an angle bracket **208** affixed at the bottom end. The angle bracket is inserted within a bolt **209**, along with a spring **212** as shown. The bolt **209** is fixed by conventional means to a stringer **206**, which extends laterally across the dasher board assembly **200**. FIG. **31**B illustrates this assembly in a quiescent (upright) position.

As shown in FIG. **31**A, when a force is subjected on the shielding panel **204** as shown by the arrow, it is forced towards the non-ice side of the assembly **200**, while the struts **202** rotate or pivot about the line along the sill **214**, and thus the lower portion of the struts **202** are forced towards the ice side of the assembly **200**. The spring **212** compresses, and tends to bias the assembly back towards its normal upright position after the force has on the panel has been removed.

An alternative embodiment to this aspect of the invention is illustrated in FIGS. **32**A and **32**B. Here, dasher board assembly **200**A utilizes a rotation axis located at the bottom of the struts **202**, at the stringer **206** near the center of the dasherboard, rather than at the sill **214**. Thus, a retaining

member **220** is fixed to the stringer **206** such that the support strut **202** may rest and rotate upon it. A biasing assembly **213** is located near the sill **214**, and comprises a bolt **224** and spring **215** fixed to the strut **202** as shown. The sill **214** comprises an opening large enough to allow the struts and/or bottom of the panel **204** to translate towards the non-ice side when a force is subjected a shown by the arrow. When this occurs, the panel and struts are caused to push towards the rear, compressing the spring **215** and pivoting about the retaining member **220**. When the force is removed, the spring biases the entire assembly back to its upright position.

4. Shielding Panel with Translational Flexibility

In a fourth aspect of the present invention, only the shielding panel is provided with translational flexibility such that only the shielding panel and its support struts can be pushed substantially parallel with and away from the ice. This is shown in FIGS. **33**A and **33**B.

This embodiment also utilizes a supported panel assembly, rather than the supportless type. A pair of biasing assemblies **236** are located as shown in FIG. **33**B. The lower portion of the struts **240** are affixed to each biasing assembly **236**, each of which comprises a bolt **244** and a spring **248**. The biasing assembly, in a quiescent position, supports the struts in an upright manner as shown in FIG. **33**B. When a force is subjected on the panel **242**, an opening in the sill **246** allows the struts/panel to be moved away from the ice side, thereby compressing the springs **248**. As such the panel/struts move away form the ice, providing the desired shock absorbing characteristics. When the force is removed, the biasing action of the springs **248** returns the assembly to its normal position.

We claim:

1. A flexible dasher board assembly comprising:

a lower frame adapted to be anchored to the ground;

an upper dasher board assembly located over the lower frame assembly, comprising means for receiving a shielding panel;

pivoting means for pivoting the upper dasher board assembly with respect to the lower frame when the upper dasher board assembly is subjected to a lateral force;

biasing means for biasing the upper dasher board assembly in an upright position when not subjected to a lateral force, the biasing means being compressible by the upper board assembly when subjected to a lateral force in order to allow the upper board assembly to pivot with respect to the lower frame.

2. The flexible dasher board assembly of claim **1** wherein the pivoting means comprises captivating means for captivating the lower frame with the upper dasher board assembly.

3. The flexible dasher board assembly of claim **2** wherein captivating means comprises a hinge assembly.

4. The flexible dasher board assembly of claim **1** wherein the pivoting means comprises an elongated member extending substantially laterally along the upper board assembly whereby a pivoting surface is formed between the elongated member and the lower frame assembly.

5. The flexible dasher board assembly of claim **4** further comprising means for restraining the upper dasher board assembly from disengaging from the lower frame when the upper dasher board assembly is subjected to a lateral force.

6. The flexible dasher board assembly of claim **5** wherein the upper dasher board assembly comprises a lower channel extending laterally along its length, the lower channel comprising a slot along its lower surface disposed between a pair of laterally extending flanges, and wherein

the restraining means comprises a hold down plate assembly, the hold down plate assembly comprising a hold down plate affixed to an upper surface of the lower frame so as to provide a pair of laterally extending gaps therebetween sufficient to captivate the flanges of the lower channel.

7. The flexible dasher board assembly of claim **6** wherein the biasing means comprises a spring and a bolt assembly comprising a locknut, the bolt assembly inserted through a retaining portion of the lower channel, the spring being captivated by the locknut and the retaining portion, the bolt assembly adapted such that a lower surface of the bolt is substantially in contact with the lower frame assembly, the spring tending to compress between the locknut and the retaining portion when a lateral force is imparted on the upper dasher board assembly, the spring tending to bias the upper dasher board assembly in an upright position when no lateral force is imparted on the upper dasher board assembly.

8. A flexible dasher board system comprising:

a plurality of flexible dasher board assemblies interconnected to form an arena for playing a game, each of the flexible dasher board assemblies comprising:

a lower frame adapted to be anchored to the ground;

an upper dasher board assembly located over the lower frame assembly, comprising means for receiving a shielding panel;

pivoting means for pivoting the upper dasher board assembly with respect to the lower frame when the upper dasher board assembly is subjected to a lateral force; and

biasing means for biasing the upper dasher board assembly in an upright position when not subjected to a lateral force, the biasing means being compressible by the upper board assembly when subjected to a lateral force in order to allow the upper board assembly to pivot with respect to the lower frame; and

compressible bolt means for flexibly connecting adjacent pairs of flexible dasher board assemblies, each of the compressible bolt means tending to keep adjacent pairs of flexible dasher board assemblies in substantial alignment with each other in the absence of a later force on any of the flexible dasher board assemblies and allowing for movement of the flexible dasher board assemblies with respect to each other when subjected to a lateral force.

9. The flexible dasher board system of claim **8** further comprising:

a plurality of shielding panels, each of the shielding panels associated with a flexible dasher board assembly and captivated by the means for receiving a shielding panel; and

a plurality of retaining clips, each of the clips configured to receive a top portion of a shielding panel, each of the clips removably attached to tops of adjacent pairs of shielding panels to flexibly align the shielding panels.

10. The flexible dasher board system of claim **8** wherein the upper board assemblies each comprises a pair of vertical posts located at each end thereof, and wherein the compressible bolt means each comprises a bolt and a pair of spring washers, the bolt inserted through the spring washers and a hole in a post of each adjacent upper board assembly and captivated with a nut, whereby the captivated adjacent posts are caused to be in substantial alignment with each other in

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the absence of a later force on any of the flexible dasher board assemblies and allow for movement of the flexible dasher board assemblies with respect to each other when subjected to a lateral force.

11. A flexible dasher board assembly comprising:

a rear base portion adapted for mounting to a floor;

a front board portion adapted for carrying a shielding panel; and

means for slidingly mounting the front board portion with respect to the rear base portion, comprising biasing means for aligning the front board portion with the rear base portion;

wherein the biasing means is adapted to allow the front board portion to slide towards the rear base portion when a lateral force is applied against the front board portion.

12. The flexible dasher board system of claim 11 wherein the front board portion comprises an upper sill extending laterally across the front board portion suitable for receiving a shielding panel, and wherein the means for slidingly mounting the front board portion with respect to the rear base portion comprises a stringer extending laterally across the rear base portion, the upper sill resting on top of the stringer and capable of sliding across the stringer when a lateral force is applied against the front board portion.

13. The flexible dasher board system of claim 12 wherein the means for slidingly mounting the front board portion with respect to the rear base portion comprises a plurality of translational spring assemblies, each of the translational spring assemblies comprising a bolt/locknut combination connected between a first lug associated with the front board portion and a second lug associated with the rear base portion and captivating therebetween a biasing spring, the biasing springs tending to cause the front board portion to remain in predetermined juxtaposition with the rear base portion in the absence of a lateral force on the front board portion, and allowing the front board portion to slide towards the rear base portion when a lateral force is applied against the front board portion.

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